THE CAUSES OF ANTE-NATAL, NATAL AND NEO-NATAL MORTALITY OF INFANTS.

A. L. MUDALIAR.

UNIVERSITY OF MADRAS PUBLICATIONS.

THE CAUSES OF ANTE-NATAL, NATAL AND NEO-NATAL MORTALITY OF INFANTS

WITH SPECIAL REFERENCE TO SOUTH INDIA

BEING THE ELIZABETH MATHAI LECTURES DELIVERED UNDER THE AUSPICES OF THE UNIVERSITY OF MADRAS AT THE GIFFORD SCHOOL OF OBSTETRICS.

BY

A. LAKSHMANASWAMI MUDALIAR, B.A., M.D.

Assistant Superintendent, Government Hospital for Women and Children, Madras.

Price Rs. 2/-

PRINTED BY

ASSOCIATED PRINTERS, MOUNT ROAD, MADRAS.

PREFACE.

The lectures are published as delivered at the Gifford School of Obstetrics, Madras.

I am indebted to the Syndicate of the University of Madras for publishing them.

The graphs were kindly prepared by Mr. M. Rathnasabapathy, Artist of the Government Hospital for Women and Children, Egmore.

I have to thank Mr. P. Rathnaswami, M.B., B.S., for kindly going through the proofs and for invaluable assistance in the preparation of these lectures.

A. LAKSHMANASWAMI.

ELIZABETH MATHAI LECTURES—1928.

The Causes of Ante-natal, Natal and Neo-natal Mortality of Infants with special reference to South India

BY

A. LAKSHMANASWAMI MUDALIAR, B.A., M.D.

LECTURE I.

20th February, 1928.

LADIES AND GENTLEMEN:—My first duty is to thank the Board of Studies in Medicine and the Syndicate of the University of Madras, for having elected me as the first Elizabeth Mathai Lecturer for this year, a privilege that I value and appreciate very much indeed.

It is a happy augury of the times, that at least seventy years after the inauguration of this University, a generous donor should have come forward and founded a lectureship in the Faculty of Medicine, and I foresee great possibilities in the realm of medical research and advance of medical knowledge in this country through this and similar lectureships, which we hope to see created in the near future. The occasion is one, however, clouded with a certain amount of melancholy interest, for this lectureship is founded in memory of one who was an alumnus of this University, and who was, alas, cut off in the prime of her life just as she showed signs of a great future for herself

and of increased usefulness to the country. The late Dr. Elizabeth Mathai graduated in 1919, and after a couple of years of postgraduate study in the United Kingdom, she returned to India as a member of the Women's Medical Service and was posted to Surat. It was here that she was taken ill and died within a couple of years of starting her life's work—a loss, I venture to submit, not only to her family, but to the medical profession and to the country at large.

The subject that I have selected is "The Causes of Ante-natal, Natal and Neo-natal Mortality of Infants with special reference to South India." It seemed to me that it was a peculiarly opportune moment, when so much of attention was directed to the question of infantile mortality in this country, that we should attempt to study the subject from a scientific point of view, so that the measures taken for the lowering of the infantile mortality rate in this country may be such as would prove useful in the light of the causes known to contribute towards the heavy mortality. Every one is familiar with the fact that the infantile mortality in India is very high indeed, but not all realize what the effect of this is likely to be in the long run. There is unfortunately a tendency in certain quarters to believe that as the birth rate in this country is so high as compared with other countries, a rather high infantile mortality need not be a matter of much concern, and perhaps is one way of reducing the tendency towards overpopulation. That such is not actually the case, that this theory of overpopulation is only a popular

belief and not warranted by facts—of this I was rudely reminded by a perusal of the report of the Census Commissioner. The census returns of 1921 for the Madras Presidency show an increase of only 923,995 persons over the number returned in March 1911, which corresponds to a decennial rate of increase of 2·2 per cent. This is the lowest rate of increase met with since the census of 1881, and is less than the rate of increase of any civilized country in the world, with the single exception of France.

Cicero wisely taught that "the very foundation of the whole commonwealth is the proper bringing up of the young," and it was Charles Kingsley who happily remarked that "nations are gathered out of nurseries." The problem of infantile mortality is intimately related to the question of ante-natal and intra-natal fœtal mortality, for not only does this signify a loss of life before birth, but its significance is all the greater as a means of estimating the loss of life in the neo-natal period. Many of the causes responsible for a high still birth rate are also causes which conduce to a high neo-natal mortality, and in any scheme for the reduction of infantile mortality, the factors which favour intra-uterine death of the fœtus should be taken into consideration. It would be superfluous to state that a child is alive long before it is born and may be so severely damaged in its intra-uterine phase that it is born under a severe handicap. That that is actually the case will be evident from a perusal of the infantile mortality rates at different age-periods.

Table showing infant mortality ratio in the two age-periods—1 month, and 2—12 months, in 1925.

PROVINCE.	UNDER 1 MONTH.	2—12 MONTHS.	TOTAL.
C. P. and Berar.	107·01	97·43	204·44
Punjab.	84·35	103·36	187·71
North-west Frontier.	63·51	75·62	139·13
Assam.	96·38	77·97	174·35
Burma.	55·05	133·94	188·99
Bengal (1924).	93·94	90·24	184·17
Bombay (1924).	72·37	118·80	191·17
United Provinces (1924).	94·83	97·16	191·99
Bihar & Orissa (1924).	85·93	72·48	158·46
Madras.	94·75	86·19	180·94

The infantile mortality in the first month is 40 to 50 per cent of the total infantile mortality rate for the year.

I have chosen to speak on this subject because, as has been explained above, the causes are so intermingled that it would be more convenient to discuss them together, and because it is possible to arrive at a more satisfactory conclusion as to the underlying causes. I propose to limit myself to causes of ante-natal mortality after the seventh month of pregnancy, i.e., after the child is viable. Similarly, in regard to neo-natal mortality, I have restricted myself to a discussion of this question in regard to the death of the new-born child in the first ten days after delivery.

Statistics in this country are extremely difficult to obtain, and the reports furnished by the Health authorities are frankly depreciatory of the value to be attached to the records furnished by them. It is very unfortunate that such should be the case, for, after all, infant mortality is to the sanitarian what the clinical thermometer is to the physician, and is the most sensitive index we possess of the extent of social welfare and the progress of sanitation. In the absence of any reliable statistics, it seemed to me the best course would be to utilize such reliable statistics as we could get at. Fortunately for us in Madras, we have in the city several large maternity institutions where many thousands of cases are delivered every year—in fact over one-third of the births in the city are recorded there, such that from these statistics a fair inference could be drawn as to the causes of infantile mortality in the three periods mentioned. It is this consideration that has induced me to limit myself to the ten-day period in considering the causes of neo-natal mortality.

Nothing surprised me so much when I began to look at the whole field of obstetrics from the infant's point of view as the paucity of attention that it had received in most of the textbooks on obstetrics. In fact, except for a brief reference here and there and a little note regarding the prognosis of the infant in certain morbid conditions of the mother, and dystocia due to abnormalities, the subject has not received the attention that it deserves. The same may be said in regard to the statistics furnished in some textbooks,

where details are given regarding the many complications of pregnancy and their effect on the mother, but the result to the child is not always noted. Perhaps it is this one-sided view that has retarded considerably a closer study of the pathology of the fœtus and the way the fœtus reacts to the several toxæmic and other pathological conditions of the mother. It is said that in the great maternity clinic at Paris, the Clinic Baudeloque, the motto is written down: "It is the duty of the obstetrician to deliver a live child out of a live mother, who will be healthy, not to deliver a still child."

The inadequate attention to the fœtus is perhaps a heritage from the physicians, and obstetricians have been too much inclined to accept the views propounded in books on medicine. Sir James Mackenzie, the great cardiologist, in his exceedingly interesting and valuable book, "Heart Diseases and Pregnancy," says: "Two years ago I was present at a meeting of a medical society where an obstetric physician read a paper on 'Pregnancy complicated by Heart Disease.' To my surprise he made no reference to the great advances that have been made in cardiology during recent years; indeed his attitude towards the subject was that of fifty years ago. I turned to a number of books on obstetrics, thinking that possibly others had not been so negligent of progress; but I found the same condition of affairs. In the recent textbooks on this latter subject which I have read, there is not the slightest indication that any advance has been made in the study of the heart during the last forty or fifty years—the writers apparently being

unconscious of the revolutionary changes which have taken place in our knowledge of this organ in this period of time." It is a rather severe rebuke to the obstetricians, but perhaps not altogether undeserved, but it is curious that even in such a book the subject has been treated purely from the maternal point of view, and one looks in vain for some light on the effects of heart disease on the fœtus in utero, the changes, if any, in intra-uterine physiology and the effect on the infant in the neo-natal period. It is perhaps the same angle of vision that was responsible for the amusing incident quoted by Herman, where it is reported that two medical men were so busy treating a case of puerperal eclampsia, washing out the stomach, cupping her loins and giving her injections, that they were suddenly surprised to hear a faint cry and found, much to their astonishment, a little child born and attempting to make its existence known.

One decided effect of this state of mentality has been that when the obstetrician is faced with a complication of pregnancy, some pathological condition of the mother, and finds that the treatment, such as is recommended by the physician for similar diseases in the non-gravid condition, is not satisfactory, he rushes to the conclusion that pregnancy should be terminated. Whether it be heart disease, tuberculosis, pernicious anæmia, acute infectious diseases, or such other complications, there has been a tendency in the past to advocate termination of pregnancy a little too indiscriminately. In what appears a hopeless situation, there is always some consolation to

the relatives, if not to the obstetrician, in doing something, and the temptation is not easily resisted. Of late, however, the opinion is gradually gaining ground that such meddlesome midwifery, apart from its being absolutely unjustifiable from the infant's point of view, is not desirable even in the interests of the mother. We shall later see that in many of these conditions, interference with pregnancy is positively harmful, and the field for such interference is getting more and more circumscribed.

I shall now place before you some statistics gathered from the chief maternity institutions in the City of Madras which will give you an idea of the extent of maternal and infantile mortality, and about some of the causes which influence the latter.

Graph I represents the total number of deliveries and the percentage of maternal mortality per year in the two hospitals A and B. It will be noticed that in both institutions there has been a steady and significant increase in the total number of deliveries, from 2,000 in 1910 to over 3,000 in 1927 in Hospital A ; while in B, it has increased from about 950 in 1915, to over 2,000 in 1927. The percentage of maternal mortality in either hospital, although it has become more steady of recent years and perhaps a little lower, has not shown any appreciable decrease and is still much higher than recorded rates of similar institutions in other countries. This is in spite of the fact that in certain well-known complications as eclampsia and septicæmia, the mortality

is now considerably less, almost 50 per cent of what it was before in Hospital A, and there has been a similar reduction in Hospital B. It may be stated that one cause for this is the influenza epidemic of 1918, which increased the incidence of maternal mortality appreciably and has since contributed directly or indirectly to an increased maternal mortality.

Graph II shows the percentage of still births, excluding macerated fœtuses and the percentage of maternal mortality in the two hospitals. In Hospital A, it will be noticed that the two curves approximate much more, whereas in Hospital B, the relationship between these two curves is far more erratic.

Graph III gives us the percentage of still births, the percentage of forceps and the percentage of still births in forceps in the two hospitals. In A the percentage of forceps is much greater and the proportion of total still births is less than in B. In regard to the proportion of still births in forceps, a slightly lower incidence is noted in B than in A.

Graph IV. Here are shown the total number of children born and the percentage of still births, of macerated births and of neo-natal mortality, i.e., of children dying within ten days of their birth. It will be seen that in both A and B there was an appreciable increase in neo-natal mortality in the years 1921—24, more so in Hospital A than in B. It is difficult to give all the causes for this heavy mortality, but I can

say that in Hospital A there occurred in those years epidemics of green diarrhœa, particularly in the winter months, which undoubtedly increased the neo-natal mortality figures for the years.

The accompanying graph V shows us the causes of neo-natal mortality in 1,039 cases, which died within the first ten days after delivery. The largest number of deaths are due to prematurity and, as has been stated above, diarrhœa was the next great causative factor and was responsible for nearly 25 per cent of the deaths. Immaturity is said to have caused nearly 13 per cent of the deaths. This is a condition that is perhaps more commonly met with in this country, being largely the result of ill-nourished or badly nourished mothers, with or without other complications, delivering themselves at term of under-mature infants. I should like to group the conditions of atelectasis, infantile convulsions and birth injuries together, for, in the absence of definite post-mortem examination on the child, the cause of mortality cannot be definitely stated. From a number of post-mortems conducted recently on such infants, we are led to the conclusion that birth injuries, intra-cranial hæmorrhages and tentorial lacerations are far more common and are really responsible for deaths ascribed to convulsions or atelectasis. In regard to prematurity also, it may be stated that premature infants are far more susceptible to birth injuries than mature children. This fact is generally ascribed to an abnormal fragility of the vessel walls of the dura and of the brain tissue itself—the result of incomplete development. The

premature infant proves remarkably vulnerable to the traumatism of birth, and it has been noted in a large percentage of premature infants where labour was definitely recorded as normal and spontaneous. Bleeding through natural passages must also be ascribed to birth injuries, and although in the majority of cases this was after a difficult labour assisted by forceps version or extraction, there were a few where labour had ended normally. The other causes are not of particular significance. It may be stated that the case of tetanus recorded was in a child delivered in a country cart on the way to hospital.

I now present to you an analysis of the still births and infantile deaths that occurred in 1927 in the two hospitals—the Government Hospital for Women and Children, and the Government Victoria Caste and Gosha Hospital. In the latter hospital 157 still births were recorded and 85 infants died for a total confinement of 1891. It will be seen that the largest number of still births are due to causes consequent on labour. If we exclude the macerated fœtuses, prematurity was the next common cause, 20 per cent of the still births having been due to this condition. One-sixth of the still births were due to maternal causes, the great majority of them, 16 out of 25, having been due to the toxæmias of pregnancy.

At the Maternity Hospital there were 247 still births among 3,100 deliveries. More than a third of these were due to complications of labour, while 72 were due to

intra-uterine maceration of fœtus. In a third of these cases either the Wasserman reaction was positive or spirochætes were present in the liver. The toxæmias of pregnancy were responsible for 13 cases and possibly for some of the still births recorded under ante-partum hæmorrhage. Prematurity again is an important factor in the causation of still births, and in a large number of cases this was associated with twins.

As regards neo-natal mortality, there were 85 deaths at the Gosha Hospital, and here also the large majority of the deaths were due to prematurity—nearly 45 per cent. Twenty per cent of the deaths are reported to have been caused by prolonged labour and asphyxia. As has been pointed above, perhaps the large majority of them were due to intra-cranial injuries, meningeal hæmorrhages. In regard to these causes in both hospitals, it must be frankly admitted that in the absence of post-mortem findings, the cause of death could not be accurately ascertained.

At the Government Hospital for Women and Children there were 189 deaths of infants in the neo-natal period. The largest number of these deaths was due to prematurity—33 per cent diarrhœa accounts for the next largest group. Birth injuries are a potent factor in the causation of neo-natal deaths, and atelectasis, convulsions, head injuries and hæmorrhage of the new-born may be grouped under this head. Thus many of the 42 cases noted are probably due to head injuries, which may be caused in natural labour as much as in aided deliveries.

As regards prematurity, we shall examine later what causes contribute to premature birth and why premature infants are so much more susceptible than full-term children. Taking the still births and neo-natal deaths into consideration, it may generally be stated that in a large majority of cases the deaths are due to ante-natal causes, that ante-natal pathological conditions of the mother form the most potent factors in their causation, and any attempt to reduce this mortality would be infructuous, if the remedy does not attempt at treating the mother in the ante-natal period.

We shall now consider some of the ante-natal pathological conditions of the mother and their effect on the child in its intra-uterine and early extra-uterine period of life, but before doing so I would just touch on two interesting observations regarding infant mortality. In spite of the general feeling that female children are born oftener, the fact remains that male children are born more frequently than female children.

The following table gives the figures classified as per sex of children born alive, still, and macerated, for nine years:—

	MALE.	FEMALE.
Number of children born alive.	9,340	8,617
Number born still.	746	600
Number born macerated.	146	111
Total number born still.	892	711

It will thus be seen that while 108 male children are born alive for every 100 female children, 125 males are born still to every 100 female still births. The same excess of male mortality is noted in the neo-natal period and in infantile mortality statistics, as the following table will show :—

Table showing male and female infantile mortality in British India.

	MALE. PER 1,000 BIRTHS.	FEMALE. PER 1,000 BIRTHS.
1920	201	188
1921	205	190
1922	183	166
1923	183	168
1924	198	181
1925	181	166

These figures are certainly not what should be expected if special care is lavished on male infants in India, if it be true, as is sometimes stated, that the female infant is consigned to a premature grave owing to the rigours of social convention.

The excess of male infantile mortality is nothing extraordinary or peculiar to India as it occurs in all other countries, as will be seen from the following table :—

Table showing the excess of male over female infant mortality in countries other than British India.

COUNTRY.	YEAR.	INFANT MORTALITY PER 1,000 REGISTERED BIRTHS.	
		MALE.	FEMALE.
United States	1919	95·8	77·0
Australia.	1919	76·3	61·7
Denmark.	1918	81·8	65·6
England & Wales.	1924	84·6	65·0
France.	1913	122·7	101·7
Italy.	1916	174·5	157·7
Japan.	1914	178·9	161·2
New Zealand.	1924	45·0	35·2
Sweden.	1915	83·8	67·4

The cause for this is so far unknown. It is possible that there are hereditary or "biological" factors which we are unable to understand at present.

The next interesting observation I have to place before you is in regard to the age incidence in pregnancy and the effect of age on pregnancy and parturition. Recent events of topical interest led me to an investigation of this question, and the following questions suggested themselves for solution:—

(1) What is the age incidence of pregnancy in this country and in other countries?

(2) What is the effect of age on parturition?

(3) What is the bearing of age on maternal and infantile mortality?

(4) Is there such a thing as an optimum age for pregnancy?

(5) What in particular is the effect of early maternity on the mother, on the fœtus, on the course of labour and on complication?

These problems have been examined strictly on a scientific basis with the available material, and no preconceived ideas have been allowed to prejudice the inferences. I shall refer to this subject in detail at a later stage, and will content myself with this graph VI which gives us an idea of the maternal mortality at different age-periods. It will be noted that there were no deaths between the ages of 12 to 14, but it must be stated that there were very few cases during this age-period. Between the ages of 15 and 18 there is a rise especially marked at 16 and 18, and then between 19 and 30 the mortality shows slight oscillations, but is definitely lower than at any other age-period. The optimum is reached at the ages of 23 and 30 and this is specially interesting in view of the fairly large numbers of deliveries. After 30 the risks of maternity seem to be great, and in spite of one or two dips in the curve, the altitude is very high indeed. There are many other interesting observations regarding age and pregnancy which I shall reserve for a future lecture.

We shall now examine the causes of ante-natal mortality of infants a little more carefully. Perhaps the most important cause which contributes largely to death of the fœtus is syphilis which may be termed "the captain

of the hosts of death of the fœtus." Whitridge Williams states that it was responsible for 24 per cent of 302 consecutive fœtal deaths in the Johns Hopkins Hospital. Syphilis was responsible for 26·4 per cent of the 705 consecutive labours under his supervision. Veeder and Jeans from Anglo-American sources give the results of 1,332 pregnancies in 250 Leutic families as compared with 1,712 pregnancies in 350 normal families. The women of the syphilitic families had double the number of miscarriages, and the mortality of children was raised by 20·5 per cent; on the other hand, the non-syphilitic marriages had four times more healthy children (76 per cent against 18·3 per cent).

Hata's Japanese statistics give still worse figures. In five years in 100 syphilitic marriages, there were only five healthy children.

Syphilis causes increased mortality in another manner. It is perhaps the most potent factor in the production of premature births. J. R. McCord records 35 per cent of premature births in 320 cases examined by him in whom the Wasserman reaction was positive. Whitridge Williams found that in a series of 334 premature labours, syphilis was the etiological factor in over 40 per cent, while toxæmia, placenta prævia and fœtal deformity were concerned in 8, 6 and 3·3 per cent respectively. Sentex who studied 485 cases in Pinard's Clinic arrived at similar conclusions, and found the underlying cause to be syphilis in 42·7, albuminuria in 19·8 and abnormalities of the fœtus in 11·1 per cent. The other causes of premature birth will be discussed later.

The infection with syphilis may occur at one of four stages :—

(1) Before conception.

(2) At the time of conception.

(3) Infection in the early months of pregnancy, and

(4) Infection in the later months of pregnancy.

We shall not take into consideration the question of infection of a lactating mother and its effect on the suckling.

As a general rule it may be stated that the shorter the interval between infection and conception, the greater the chances of miscarriage or still birth. It is well known that in the pregnant woman, syphilis runs a benign course, so much so that occasionally the mother may not have any suspicions of the infection, and the first sign of it is the birth of a syphilitic child or an apparently healthy child which develops congenital syphilis later. In cases where the interval is more than three years between the infection and conception, it may be that the mother gives birth to an apparently healthy child, which, however, is likely to manifest signs of syphilis. As the interval increases, the manifestations of congenital syphilis are fainter and occur at a later stage. Thus may be accounted the history of previous pregnancies that a syphilitic mother may give—miscarriage, macerated fœtus, still birth, syphilitic child, and an apparently healthy child.

When infection and conception occur simultaneously, the infection of the fœtus would seem to be certain and a macerated fœtus is generally the result. If the infection should take place in the later weeks of pregnancy, the child may escape altogether, but it is necessary to realize that it may be infected if the mother should begin to suckle it. The adoption of anti-syphilitic treatment at all stages of the disease profoundly affects the prognosis of the child. Nowhere are better results obtained by ante-natal care and treatment than in this affection.

From the point of view of treatment, therefore, the diagnosis of syphilis is a matter of great importance. It has already been stated that the course of syphilis in a pregnant woman may be mild and thus give rise to considerable difficulties in the clinical diagnosis of this condition. With the introduction of the Wasserman reaction for syphilis, the whole outlook has changed and we now know that Colles's Law and Profeta's Law are really due to the general laws of immunity and do not by any means signify absence of infection.

How far is the Wasserman reaction reliable in pregnancy? This is indeed a very important question from the point of view of treatment and fœtal prognosis. Recently the value of the Wasserman reaction during pregnancy has been questioned, because positive reactions have often been found in women who clinically and in their past history gave no evidence of syphilis. It was assumed that the serum in pregnancy as in

certain other diseases could itself produce a positive reaction. Handorn and Georgi consider that the sero-diagnosis of syphilis is of extreme importance in obstetrics and that the question of the reliability of Wasserman cannot be taken too seriously. They examined 154 clinically healthy women during pregnancy, labour and the puerperium. Of 78 healthy women whose blood was examined during the puerperium only two gave a positive reaction. They conclude that the sero-diagnosis of syphilis is entirely reliable in pregnancy, labour and puerperium.

The observations of J. R. McCord of the University Schools of Medicine, Emons, are equally interesting. He did the test on 500 pregnant women, both at the pre-natal clinic and at the hospital at the time of labour. The reaction on 500 women agreed in 87 per cent. There were 39 cases in which the clinic Wasserman were positive, the labour Wasserman were negative. Of these 31 cases had had antisyphilitic treatment. The reactions agreed in 939. At the Government Hospital for Women and Children, in a series of 482 cases of pregnant women whose blood was examined for Wasserman it was noticed that the Wasserman reaction was negative in 407 cases.

	B. F. 407
+ + + (strong)	41
+ + (moderate)	19
+ (weak)	15
Total	482

There were 24 cases of macerated fœtuses in the 41 strong, and 9 in the moderate, while there were 2 in the weak. Spirochætes were found in 11 of the macerated fœtuses of the strong, and 2 of the moderate.

For some time we have been noting the result of the Wasserman and comparing this with the result of examination of the liver for spirochætes in macerated fœtuses. A strong Wasserman need not necessarily imply the presence of spirochætes in the liver, and conversely the presence or abundance of spirochætes in the liver is no criterion for a positive Wasserman, much less a strong Wasserman.

The question of the Wasserman reaction in the puerperium, and its reliability as a diagnostic test awaits solution.

LECTURE II.

Heart Disease and Pregnancy.—We shall next consider some of the other pathological affections in pregnancy and their effect on the fœtus. We shall consider the question of heart disease in relation to pregnancy.

Angus Macdonald in a treatise published fifty years ago expressed the following conclusions based on his experience of 31 cases.

"Chronic heart disease, and specially severe mitral stenosis and aortic incompetency, ought to be looked on as a grave contraindication to marriage. Mitral regurgitation is a much milder complication in pregnancy.

The onset of heart failure during pregnancy is of serious prognostic importance.

Exposure to cold and severe exertions are both to be carefully avoided.

'Downbearing' during labour must be eliminated so far as possible by the use of the forceps or version and chloroform is to be recommended in most cases.

Premature labour is to be induced seldom or never, as it is likely to do more harm than good, except in women with great distension of the abdomen (i.e., in cases of hydramnios), lactation cannot be permitted as it favours the persistence of cardiac hypertrophy."

These conclusions of Angus Macdonald are remarkably accurate and are applicable to the present time except that some of his opinions have naturally to be modified in the light of recent research in cardiology.

What is the effect of pregnancy and labour on the heart?

(1) The increasing size of the uterus and its contents imposes a heavy weight on the patient.

(2) The extra demands of the growing breasts, uterus and placental circulation, require an increased output of blood from the maternal heart.

(3) The uterine tumour produces certain pressure effects, particularly in primi-gravida.

(*a*) In the later months the heart is displaced upwards and rotated to the left.

(*b*) The costal angle is expanded and the bases of the lungs and the heart itself are subjected to pressure. This interferes with the freedom of movement of these organs and embarrasses the pulmonary circulation which is particularly undesirable in mitral stenosis.

Of the minor effects, varicose veins and œdema may be mentioned; the pelvic vessels are especially sensitive to pressure on account of the physiological relaxation induced by pregnancy.

Three questions naturally suggest themselves for consideration:—

How should we deal with a case of heart disease in the first half of pregnancy?

How should we deal with her in the later months of pregnancy?

What is the mode of delivery that should be selected?

Daly from a study of 117 cases of heart disease in pregnancy dealt with in the Chicago Lying-in-hospital concludes that

(1) nearly every woman with organic heart disease, regardless of lesion, can carry thorough pregnancy successfully;

(2) interruption of pregnancy to save life or prevent cardiac failure is rarely necessary;

(3) failure, complete or partial, can with rare exceptions be compensated and pregnancy continued;

(4) abortion or delivery in the presence of failure, unless the patient is already in labour is unwise, because anything that is done is an insult to the already overwhelmed heart-muscle;

(5) there is no material cardiac damage incurred by pregnancy, i.e., that after completion of the pregnancy the heart is as efficient as it was at the beginning;

(6) prevention of trouble is accomplished early in pregnancy, not at term, during labour or delivery.

It is only fair to add that these views are not supported by other authorities. Hamilton and Kellog advise interruption early in pregnancy; (1) for a patient who has or has had clear signs of congestive failure, (2) for a patient who has complicating nephrites or hypertension,

(3) for a patient who has auricular fibrillation, (4) for a patient who has had a recent or has at present rheumatic fever.

The treatment in the later months of pregnancy has been well summarized by Leyland Robinson of the Liverpool Maternity Hospital. He states: " The induction of premature labour, when the child is viable and the cardiac condition good, is a sound precaution for any type of heart disease. For serious heart failure in advanced pregnancy induction of labour is but rarely indicated. It is better practice to attempt to restore compensation first and to prolong pregnancy until compensation is re-established. Whether successful or not such treatment is more likely to succeed than induction, because labour, in the presence of serious heart failure, is almost certain to kill the patient. The spontaneous onset of labour is an accident that cannot be prevented but the results are such that deliberate induction is unjustifiable."

Our own experience has been in favour of adopting a conservative method of treatment. In spite of alarming symptoms consequent on decompensation, we have seen patients recover and compensation established both during the pregnancy and after delivery. Induction of premature labour is thoroughly unjustifiable when decompensation has occurred and should be unnecessary in a large number of cases if practised as a routine measure. Nor are we so certain that there are not risks

incidental to such induction, risks of shock and even of sepsis—it may be mild—but the consequent rise in temperature and general impairment of health are serious factors to take note of.

So far as delivery is concerned, the strain is most felt on the heart in the second stage of labour when the accessory muscles of labour are called into activity. Help with forceps with mild anæsthesia will relieve an overburdened heart. We have no experience of caesarian section but we would unhesitatingly discountenance every other form of forced delivery.

The treatment suggested would imply a better prognosis for the fœtus and no worse results for the mother.

Tuberculosis.—Let us next take the question of tuberculosis complicating pregnancy. The following three questions arise :—

(1) Does pregnancy act deleteriously upon the course of pulmonary tuberculosis?

(2) Does the termination of pregnancy benefit the patient?

(3) What will be the condition of the infant if pregnancy be allowed to continue?

Raimondi and Gonsalex state that "in many tuberculous women the pulmonary lesion improves during pregnancy and grows worse after parturition. The amelioration is doubtless due to the elevation of the diaphragm caused by the enlargement of the uterus and to the relative repose of the affected lung thereby obtained.

The aggravation of the pulmonary lesion after childbirth, they ascribe to the brusque decompression of the lung in consequence of descent of the diaphragm. Pregnancy has acted as a "pneumo-thorax."

Norris and Murphy after a comparison between the end results of 104 non-pregnant and 166 pregnant tuberculous women come to the conclusion that pregnancy does exercise a slightly evil influence upon pulmonary tuberculosis.

So far as termination of pregnancy is concerned, opinion is gaining ground that interruption is rarely indicated. Termination of pregnancy is advocated only when pregnancy has not exceeded three months. The treatment, on the other hand, should be solely medical when pregnancy has passed three months, whatever the extent and type of lesion, and if the tuberculosis is acutely progressive or on the other hand is stationary.

So far as the child is concerned, as a rule it is carried to full term and parturition is often normal. The child is generally fairly well developed and healthy and apparently has not suffered from the incidence of tuberculosis in the mother. It is, however, to be remembered that the risks of infection subsequent to birth are very great and the infant should never be nursed by the mother, both for the sake of the child and for her own sake. A pthisical mother who begets children frequently is likely, however, to be confined of weaklings in subsequent pregnancies.

Diabetes.—For a long time diabetes was regarded as one of the most serious complications of pregnancy.

In 1909 Williams stated that its gravity has been overestimated, yet at present there is a great divergence of opinion concerning its importance as a complication of pregnancy. Opinion is, however, agreed that only a small proportion—about 5 per cent of diabetic women become pregnant. There is a higher incidence of abortion or premature labour, and when labour progresses to term, the children are usually above the average in size. Hydramnios seems to be a frequent complication. The fœtal mortality including not only infants which die in utero, but those which succumb as a result of difficult labour, is estimated at about 50 per cent. The future of those which survive is also bad, 80 per cent dying in the first few days after birth. The development of acidosis may cause the death of the child in utero.

Since the introduction of insulin, however, the fœtal and maternal prognosis has considerably improved. Insulin exerts no deleterious influence upon the fœtus.

My own experience of these cases is limited, only four patients having been treated. One of them presented unusual complications during delivery, due to the large size of the child and the fact that the child was dead in utero. The delivery had to be effected piecemeal, and although it took fully an hour, the mother, the wife a medical man, had an apyretic normal puerperium.

Infectious fevers.—We shall next consider the effect of the specific infectious diseases, such as enteric fever, influenza, relapsing fever, smallpox, etc., occurring in pregnancy, on the fœtus. A common feature in most of

these cases is the elevation of temperature that results. The effect of temperature on the fœtus in utero is very marked. Runge summarizes the effects of elevation of temperature on the fœtus thus :—

(1) The temperature of the fœtus is habitually higher than that of the mother and maintains relatively greater height when the mother's temperature becomes abnormal.

(2) The fœtus dies from the effects of increased temperature before such increase becomes fatal to the mother.

(3) The temperature of the mother, if only raised for a short period to 106·7° is fatal to the fœtus.

The general effect of fevers on the fœtus is more felt in the early or late months of pregnancy, at either of which period abortion or premature labour is likely to result. Sudden variations of temperature are more likely to cause premature delivery. The higher the range of temperature, the more likely is the occurrence of premature labour. Jellet observes that where cyanosis is marked during the course of labour, premature delivery is very liable to occur. Our own observations in regard to the course of pregnancy complicated by pneumonia leads us to the same inference. Abortion and premature labour are far more common in this condition, and these occur at the height of the disease, when cyanosis and respiratory embarrassment are marked.

Typhoid fever as a complication of pregnancy is not infrequent in our practice. I have the records of eighteen

patients who were treated for typhoid and in whom a positive 1 in 200 widal reaction was obtained. In four of these cases, the pregnancy was under four months, in six it was below eight months, and in the rest it was near term. Two of these cases aborted, one was confined at eighth month, one woman died undelivered and the rest recovered without labour setting in. In the absence of complications, it may be said that the prognosis in typhoid fever is not worse in the pregnant woman and the fœtus is not jeopardized by the incidence of this disease.

We have had experience of *relapsing fever* complicating pregnancy during the recent epidemics which occurred a couple of years ago. As is to be expected with a disease with such sudden and high elevations of temperature, abortion is frequent and premature labour sets in at the height of the fever.

Our experience during the pandemic of *influenza* in 1918 shows that it constitutes an unusually serious complication of pregnancy, more particularly the pneumonic type. J. W. Harris in a statistical study based on 1,350 cases, found that the gross maternal mortality was 27 per cent which increased to 50 per cent when pneumonia developed. The disease also has a deleterious effect on pregnancy which was interrupted in 26 per cent of uncomplicated and 52 per cent of those accompanied by pneumonia. When the disease ended fatally spontaneous termination of pregnancy occurred in 62 per cent of cases before death of the mother. In other words occurrence of abortion and premature labour add to the gravity of the disease.

Smallpox is always handy to us in this country and several pregnant women have been admitted into this hospital with this complication. My own impression is that smallpox definitely adds to the risks both of the fœtus and the mother. The hæmorrhagic is almost always fatal—both cases in our practice died. Even in the ordinary type there is a slightly greater incidence of premature delivery. The risks are at two stages, on the 3rd day when the initial fever is at its maximum, and when the secondary fever reached its highest.

A question of considerable interest in this connection is: Can an unborn infant be immunized against smallpox by vaccination of mother during her pregnancy? The observations of Liberman at the Hermankeifer Hospital, Detroit, on 350 cases of pregnant women who were all vaccinated are interesting. The conclusions drawn by him are:—

(1) Vaccination of the mother during pregnancy resulting in a positive reaction does not convey any specific immunity to the unborn infant inasmuch as 71 per cent of the infants react with positive scars if vaccinated on the first day after delivery.

(2) Any immunity which is present in the child is not sufficient to afford any protection even from vaccination.

(3) Women may be vaccinated with safety at any period of their pregnancy.

(4) New-born infants may be vaccinated on the first day after birth without undue symptoms and without any dereliction to their future welfare.

(5) In clinics routine vaccination of mothers and infants is advisable both for protection and for spreading civic health propaganda.

Malaria is such a common disease in this country that one meets frequently with pregnant women with this complication. At one time there was considerable hesitation in the treatment of this complication and it was feared that abortion or premature labour may result. My experience, based on a very large number of cases treated in this hospital, is that quinine is a safe drug to give in malaria in the pregnant. The cause of abortion or premature delivery is the temperature more than anything else, and we have found that quinine does not affect the uterus when not in labour. A note of warning may however be sounded here. I hold that the best salt of quinine is the bi-hydrochloride, which should be administered in seven-grain doses once a day. The sulphate produces unsatisfactory results and heavier doses should be deprecated. Of late, quinine has been advocated for induction of labour in association with castor oil and pitutrin and we have ourselves given in this hospital ten-grain doses of quinine to a woman in labour to stimulate uterine contractions. The question has been raised: Can quinine kill the fœtus in utero? The only criticism DeLee had to offer was that it might lead to precipitate birth. Many observers have recorded the fact that quinine has no deleterious effect on the fœtus. Porak seems to have been the only one who expressed a different opinion. He claimed that after ingestion of quinine, the amniotic fluid is often found

discoloured and many children are born asphyxiated. Such children if resuscitated fail to nurse well. Guggisberg challenges the correctness of these observations. His own studies have convinced him that the fœtal heart-beats are never slowed down by quinine and that neither during nor after delivery need there be any fear for the well-being of the child. In fact there seems to be a remarkable tolerance on the part of the child even for large doses of quinine.

Uterine tumours.—I shall next touch on the effects of *uterine tumours* on pregnancy and the fœtus. The tumours considered here are fibro-myomata and cancer of the cervix. The effect of fibroids on pregnancy depend on their situation and size. Pierson in a series of 191 cases observed that 24 per cent of the cases ended in abortion or premature labour, while the fœtal mortality of these cases was 78·7 per cent. Similar findings are reported by other writers. Pinard found 15 per cent, Lobenstaine 15 per cent, while Cragin and Ryder reported a 24 per cent incidence of spontaneous abortion or premature labour in cases of fibroids complicating pregnancy. These facts establish clearly the high incidence of spontaneous abortion and premature labour. Fibro-myomata must therefore be ranked clinically with the toxæmias of pregnancy, syphilis and abnormal conditions of the cervix, as one of the most important conditions causing abortion and premature labour.

Cancer of the cervix complicating pregnancy is a comparatively rare condition. Grossl found 120 cases

in 224,080 cases of childbirth. This means 1 in 1,867. Sarvey collected 53 cases in 84,148 cases, which gives an incidence of 1 in 1,600. DeLee gives the incidence as 1 in 2,000. In the reports of the St. Mary's Hospital, Manchester, for the years 1915—23 inclusive, 6 cases are reported in 23,967 cases, or 1 in 4,000 cases. The Rotunda Hospital reports for a period of 25 years dealing with about 45,000 cases of childbirth do not contain a single case. The reports of the Liverpool Maternity Hospital for the years 1916—23 inclusive and dealing with 16,680 cases of childbirth are similarly negative. At the Government Hospital for Women and Children in about 22,500 cases confined in the years 1920—27, I met with but one case of cancer of cervix of the proliferating type complicating pregnancy in the ninth month on whom I performed a caesarian pan hysterectony. The child was alive and healthy, but the patient succumbed on the 10th day from septic complications. You will thus see that the experience of most obstetricians must necessarily be very limited and, if occasionally the subject is dealt with at length, it is perhaps because the knowledge of cancer in the non-gravid is utilized to draw inferences.

A question intimately connected with the treatment of cancer in the gravid is: Is the child in utero injured by Roentgen radiation of the mother? This is interesting from two points of view, in cases of cancer of the cervix where treatment other than operation may be found necessary and in certain conditions where emptying of the uterus is recommended in the earlier months of

pregnancy. Driessen who has carried on extensive investigation on pregnant women and animals states: "While it has not been demonstrated that a single exposure, as used in making an X-ray picture of a pregnant woman has any deleterious effect upon the fœtus in utero, the making of repeated exposures may not be without definite danger to the child." He holds that therapeutic doses should only be given in urgent cases and then with the distinct understanding that the fœtus will be sacrificed. Another observation that has been made by several radiologists is that frequent X-ray exposures lead to arrested development in the new-born and that the prognosis, physically and intellectually, of an X-ray child was not good.

Intra-natal death.—I shall now touch on a subject of greater interest and one with which most of us are more familiar, the causes of intra-natal death of the fœtus. In a consideration of this subject I shall limit myself to the causes which bring about the death of an otherwise healthy fœtus during the course of labour.

The question arises: What are the signs of fœtal distress during labour and what is the exact significance of each of these signs? Textbooks tell us that the indications for interference on behalf of the child are:—

(1) A fœtal heart-rate rising progressively above 160 in the interval between the pains, or falling below 120.

(2) Tumultuous movements on the part of the fœtus.

(3) The coming away of meconium, unmixed with liquor amnii in a head presentation.

(4) Prolapse of the cord.

This is but an imperfect statement of the case. The fœtal heart is undoubtedly the most important sign to be taken into consideration, for variations in the fœtal heart occur at an earlier stage than the other signs.

Which is a graver sign of distress, a slow fœtal heart or a rapid fœtal heart? My experience leads me to the conclusion that in many cases a fœtal heart of 120 is not of such serious import and may well be allowed to slow down to 116 or even 110 so long as the intensity of the sound is not diminished. On the other hand a fœtal heart of over 160, i.e., 170 or 180, I consider of far graver significance. In 100 cases of forceps delivery which I examined from this particular sign, allowing as far as possible for a similar condition in regard to presentation and position of the head in the pelvic cavity, the following results were noted :—

F. H. slow	...	60 cases	...	3 still.
F. H. rapid	...	24 ,,	...	4 ,,
F. H. rapid & large caput	...	5 ,,	...	2 ,,
F. H. slow & large caput	...	7 ,,	...	2 ,,
F. H. varying	...	4 ,,	...	Nil.

A sign of grave significance and one which leads to a deeply asphyxiated condition of the child, if not to a still birth is the formation of a large caput. It is unfortunate

that in many of the textbooks this sign is either not mentioned or not sufficiently emphasized. The fœtal heart may show no indication either by slowing or by rapidity; and yet in the presence of a large caput the child is born still or very deeply asphyxiated. This I ascribe to one of two causes; a large caput implies a considerable amount of pressure on the head which is transmitted to the brain easily owing to the presence of the sutures and fontanelles and this pressure is felt ultimately on the floor of the fourth ventricle, where the vital centres are situated. The respiratory centre is far more easily paralysed than the circulatory, so that although the cord pulsates for a good length of time after delivery, the child does not make any attempt at respiration. Another cause is probably some form of cerebral injury, involving the respiratory centre.

For a similar reason I hold that extreme moulding of the head should be considered a sign of fœtal distress.

The appearance of meconium is not *per se* of such vital importance as some suppose, but the presence of meconium with a slow fœtal heart is an added indication for interference.

Tumultuous movements of the fœtus correspond to the convulsions in the second stage of asphyxia in the adult and are due to a similar cause. It is exceedingly rarely noticed, having been met with only twice in my practice.

Prolongation of labour during the first stage influences the heart rate of the fœtus very little, but during the second stage the effect is much more marked and frequent.

The question arises: Is the fœtus in distress when the membranes are still intact in a healthy woman in labour? For long I was under the impression that so long as the membranes were unruptured, the fœtus was not likely to be harmfully affected by the uterine contractions, and variations in the F. H. need not be seriously taken note of. Within the last two or three years, this complaisance was found untenable and I now believe that under certain conditions the fœtus may be in danger:—

(1) In cases where there is not a sufficiency of liquor amnii—a condition analogous to oligo-hydrammios.

(2) If the cord is round the neck or there is a short cord.

(3) If the uterine contractions are very strong and occur at very frequent intervals.

(4) If there is a considerable moulding of the head.

I shall now consider the most common method of artificial delivery and its effects on the fœtus. The forceps is at once the most useful and the most dangerous of instruments in the obstetrician's armamentariums. Its indiscriminate use has led to serious injury to the mother and high fœtal mortality, and an instrument which should be mainly a saviour of fœtal life has

actually proved a menace to the child in inexperienced or incompetent hands. The following table shows the results of forceps application in different institutions :—

Table Showing Results in Forceps.

Institutions.	Total no. of deliveries.	Total no. of forceps.	Percentage on forceps.	Percentage of still births including macerated.
London Maternity Hospital (15 years) ..	17,738	1,336	7·7	10·8
Queen Charlotte ...	...	1,300	...	6
Rotunda (Purefoy) ...	11,098	431	3·8	13·92
Montreal Maternity ...	15,000	186	1·2	16·6
G.M.H. Madras (10 years) 1916—1925 ...	26,630	2,865	10	12
Ramaswamy Lying-in-hospital (10 years) ...	17,072	880	5·1	15·8

The application of forceps is a matter of technical skill. The high forceps is fortunately condemned on all hands and should never be recommended. There is an impression that once a forceps has been applied, it is only a question of strength to pull the head out. That this is not the case and that mere strength is of no use has been frequently demonstrated in our practice in this hospital. If it were a question of strength, Eugene Sandow and Professor Ramamurthi would have had the best qualifications to become obstetricians, and a whole sex may have been banned the use of the obstetric forceps ! A great deal depends on the method of application

and the method of traction. In the practice of a country practitioner, there are probably more emergencies of an obstetric nature than any other, and there is scarcely any other operation in which greater judgment is required, in which two lives are at stake or where the operator has to make up his own mind without the help of a consultant. In surgical practice if a beginner or a non-operating practitioner contemplated performing a small operation and then found that a bigger one was necessary he would get the help of an expert. The trouble is that an ordinary pull with the forceps having failed, the doctor does not realize that he is up against something serious. He does not get help, but pulls all the harder.

Let it be clearly realized that in the application of forceps great delicacy is required. I have always taught it and tried to practise that forceps should be applied with no force, that they should in fact slip in easily, and that to guide the forceps into proper position it is necessary to insert but one or two fingers into the vagina. The insertion of the half hand or whole hand dislodges the head and converts a mid forceps into a high forceps, and a high forceps into a floating forceps. The forcible introduction of the blades, without observing the law of curves, results in lacerations of maternal tissue, and compression and injury to the fœtal skull. In locking the forceps, the right or upper blade should always be made to meet the lower blade, and both blades should be pressed well against the perineum.

To use the forceps to make the diameter of the head smaller, i.e., as a compressor, is absolutely wrong. I have always felt that the screw in the axis traction forceps should never be tightened but screwed on sufficiently lightly just to prevent the blades separating. Even then it is better to unloosen the screw, now and again.

There remains the question of traction which is the one proper use to which the instrument should be put. The proper way of applying traction is to apply it steadily with one hand, applying counter pressure with body leaning backwards as in a tug-of-war pull. I have always condemned the aristocrat's pull where the operator sits in his chair and puts his foot against the cot and pulls; nor is the hunchback pull, where the obstetrician leans forward and pulls, likely to result in an easy delivery. Apart from the dangers of slipping, such pulls necessitate a longer amount of traction, compression of head, and the attendant injuries on the head of the child. One cannot too strongly condemn the jerky pull either, which causes greater shock to the child and occasionally cerebral injury.

In cases of occipito-posterior presentations, the forceps is used frequently, and not often with gratifying results. An occipito-posterior case ought to be easily diagnosed, if not by palpation and vaginal examination, at least when the forceps is applied. It will be found in these cases that:—

(1) The blades slip in with greater difficulty.

(2) Locking is more difficult.

(3) The shanks do not come into exact apposition.

(4) On traction, the forceps generally tend to rotate forwards.

(5) There is a greater risk of the forceps slipping.

Rotation with the forceps in occipito-posterior presentations is not always safe from the point of view of mother and child, and rotation by the hand is much to be preferred. When rotation is, however, performed with care, the results are gratifying. The effect of the forceps slipping is disastrous. It causes severe laceration of the vagina and perineum, and to the child the pressure and injury caused by slipping may entail severe intra-cranial hæmorrhage.

In concluding my remarks on forceps I may perhaps be allowed to quote the remarks of Prof. P. B. Watson, M.D., F.R.C.S. (Ed.) F.A.C.S., Professor of Obstetrics and Gynæcology in Columbia University, and Director of Swame Hospital for Women, who in an article on the responsibility of the obstetric teacher says :—

"There is a greater need to-day than ever there was to preach against 'Meddlesome Midwifery' because with our increased hospital facilities, the attendance of trained nurses, and the ease with which a 'set up' for the operation can be made there is a greater temptation to interfere. Do our students in their long hospital training see too many instrumental deliveries in proportion to normal deliveries? Speaking from my own experience I think they do and that they are likely to go away with a wrong impression unless the teacher is

at pains to discuss fully with them the indications for every interference. They see the skilled obstetrician emerge successfully from a difficult forceps case or version and breech delivery and do not always realize that his success is due partly to the ideal conditions under which he is working as regards 'set-up' and assistance partly to his individual skill, and that if they attempted the same procedure in the home of one of their future patients they would be lacking in both. They do realize this in the case of a major surgical operation and from this point of view it must be driven into them that operative obstetrics is surgery and very often major surgery and that before they can undertake these operations they must have more training than they can possibly receive in their undergraduate course." Wiser words were never given expression to, and may every teacher and student of obstetrics ponder over these words of wisdom.

When one meets with difficulty in a case of forceps, there are two ways of enlarging the pelvis—the Walcher's position, and symphisiotomy or pubiotomy. It is not always realized that in Walcher's position, the extremities should hang freely without touching the ground, that the fœtal head should be pulled into the cavity, and that thereafter the delivery should be completed with the woman in the left lateral or dorsal position.

Symphisiotomy is loosing ground everywhere and the prevalent fashion is to condemn it. We have in this hospital found it very handy and successful, and our

results are so encouraging that in spite of adverse criticism and the stigma of being backward, we shall continue to practise and preach its adoption. We hope ere long to publish our results under the caption "Is Symphisiotomy dead as the Dodo?"

Breech.—I now come to another presentation—breech—and we shall discuss its effect on the fœtus. We had been taught, and books still emphasize the fact, that breech deliveries are very fatal to the child and should be avoided as far as possible. It is interesting, however, to note that textbooks are generally content to give a much lower fœtal mortality than what obtains in hospital practice, as is evident from the following table:—

Fœtal mortality in Breech deliveries.

Textbooks.	Prim.	Multi.
Eden and Holland	10%	...
Ten teachers	8·3%	10%
Aleck Bourne	11%	3·3%
Cameron & Hewith	12%	4%
Whitridge Williams	10 to 15%	8·3%
Fairbain	10%	3 to 4%

Hospital Practice.

Hospital.	Total cases.	Fœtal mortality.	Neo-natal mortality.
Jessop-Sheffield	50	34 %	6 %
Queen Charlotte	51	36 %	2 %
Leeds Maternity	156	25 %	12·1 %
Birmingham	52	40·4 %	13·4 %
St. Mary's, Manchester ...	74	33·7 %	11·3 %
Liverpool	63	23·8 %	4·7 %
Rotunda, Dublin	700	28·8 %	?
Government Hospital for Women and Children, Madras ...	812	21·8 %	11·2 %

I am not convinced that every case of breech should of necessity be converted into a case of vertex. On the other hand I hold that in an uncomplicated case in a multipara, a breech is no more dangerous than a vertex, and that a breech is to be preferred under three circumstances :—

(1) In moderate degrees of flat pelvis.
(2) In cases of placenta prævia.
(3) In cases of prolapse of cord.

In a primipara with a normal pelvis and normal child, the risks are only slightly greater. I hold that in multipara, a breech is far safer from the maternal and fœtal point of view than a high or floating forceps. It must be realized that the high mortality of breech cases is partly due to its incidence in a greater measure in

cases of contracted pelvis. Where the pelvis is normal and for some reason the normal head does not engage itself in the brim of the pelvis, particularly in multipara, internal podalic version and extraction is about the most satisfactory method of termination.

I must however add that a great deal depends on the technique of breech delivery.

The first essential is to see that the passages are well dilated. To attempt to deliver the breech with a partially dilated or rigid cervix is to court disaster. Traction on one leg is sufficient, and one need not place any importance on which leg it is so long as forward rotation is favoured to bring the back anteriory. The usual precaution should be taken to keep the body warm. If the arms are extended the best way to release them is to apply traction till the body descends and one or other of the axillary folds are seen well out of the vulva. Then, with one finger hooked along the shoulder, the arm could be easily released. The practice of inserting the whole hand into the vagina and trying to flex the extended arms, when the child is born up to the umbilicus is, in my opinion, a grave mistake and likely to lead to delay, injury and greater risk of sepsis. The head should always be delivered with efficient fundal pressure with Smellie's method or any other suitable method.

The application of the forceps to the after-coming head is a moot point in obstetrics. Discussing this question Jellet states: "A few words must be said regarding the application of the forceps to the after-coming head, though it does not appear to us that there

is large field for its use. In the case of a living child, Martin's or Smellie's method of extraction is more suitable and affords a better prospect of life to the child, since each of them can be adopted more rapidly and at least as much force can be applied as by the forceps Further, as the head can be guided better by the fingers into correspondence with the diameters of the pelvis than it can with the forceps, the effective part of the force applied is also greater in manual than in forceps extraction. If, on the other hand, the fœtus is dead and extraction by Martin's or Smellie's Method has failed, it is preferable to perforate the head and then extract it, than by applying the forceps to subject the mother to the crushing of the soft parts, which must result during the delivery of the head."

The position taken up by Jellet seems to me to be most logical and is in complete accord with our practice here.

LECTURE III.

Transverse presentation.—We shall next take up the subject of transverse presentation. It is unfortunate that even after so many years of obstetric practice, it has not been realized by the indigenous midwives that it is disastrous to the mother and to the child to try and deliver a case where the arm is prolapsed, by traction on the hand. If a case of transverse presentation is attended to at an early stage, there should not be any very great risk to the child, except it be the risks incidental to the abnormality which is the prime factor in the causation of a transverse presentation. A transverse presentation could be easily converted into a vertex or breech presentation by external or bipolar version before the rupture of membranes. I hold that it is preferable, unless there be a contra-indication, to convert it into a breech, for, in case the breech slips away from the brim of the pelvis, it is easier to get at the foot or knee by internal manipulation as the podalic pole is within reach. In cases where the woman comes in after rupture of membranes, the treatment will naturally depend on two factors—whether the fœtus is alive, and whether the uterus is lax, tonically contracted or threatening to rupture. One simple precaution may however be noted in performing internal

podalic version. It is very much better to hook a finger round the knee and draw the leg down than to attempt to catch the foot and pull it down. In a uterus that is tonically contracted, the hand when introduced into the uterus gets cramped and it is very difficult to stretch the fingers and get a hold of the foot, much less to draw it down.

Ante-partum Hæmorrhage.—I now come to a consideration of the effect of ante-partum hæmorrhage on fœtal mortality. In cases of concealed accidental hæmorrhage, from the very nature of the complication, it is obvious that there should be grave danger for the child. The separation of the placenta and hæmorrhage incidental to any serious case of concealed accidental hæmorrhage results in almost certain death of the fœtus, and except in the minor degrees the chances of the fœtus surviving are so remote that it need scarcely be considered. In cases of external accidental hæmorrhage the fœtal mortality would very much depend on the severity of the hæmorrhage, the period of pregnancy and the nature of treatment adopted. The mortality is variously estimated between 40 and 60 per cent.

The question of fœtal mortality in placenta prævia is one beset with many considerations. There is no doubt that in some cases the interests of the mother and of the child are opposed and treatment which from the maternal point of view is quite safe may be risky to the fœtus. The following table shows the maternal and

fœtal mortality in placenta prævia in some of the chief maternity clinics.

Institution.	No. of cases.	Mat. mortality.	Fœtal mortality.	Neo-natal mortality.
Montreal Maternity (Braxton Hicks)	22	nil	80·95	
Queen Charlotte				
By plugging—Central.	22	9·1	63·7	27·3
,, Lateral.	17	11·7	52·9	23·5
Cæsarian.				
Edinburgh Royal Maternity.	14	7·20	7·20	
Montreal Maternity.	12	16·67	33·14	
All Methods.				
Edinburgh Royal Maternity.	254	9·8	64	
Karlsruhe Clinic.	172	9·8	52·9	
Boston Lying-in.	92	19·56	55·0	
New York Lying-in.	591	12·10	60·0	
Chicago.	70	1·30	28·0	
Johns Hopkins.	66	10·60	72·0	
St. Mary's Hospital, Manchester.	405	8·0	61·0	
Govt. Hospital for Women and Children, Madras.	93	22·5	66·6	11·8
Raja Sir Ramaswamy, Madras.	84	?	·5	4·

These statistics reveal the fact that the mortality is nearly 60 per cent, the only hospital where a surprisingly low maternal and fœtal mortality is recorded being Chicago. It will be also noticed that where the maternal mortality is low as by Braxton Hicks method at the Montreal Maternity, the fœtal mortality is very high indeed, over 80 per cent.

Two indications are primarily to be met with in the treatment of placenta prævia—the arrest of hæmorrhage and the completion of delivery. There are several methods of doing this, chief amongst which being :—

(1) Rupture of membranes and application of a binder.

(2) Injection of pituitrin.

(3) Plugging of vagina.

(4) Braxton Hicks method of treatment.

(5) Introduction of Champetier De Ribs bag.

(6) Application of forceps or extraction.

(7) Cæsarian section.

Which of these methods should be adopted depends on

(*a*) the term of pregnancy ;

(*b*) the variety of placenta prævia, whether central, lateral or marginal ;

(*c*) the condition of the patient at the time of admission ;

(*d*) whether she is a primipara or multipara;

(*e*) the dilatation of the cervix.

From the point of view of the fœtal prognosis, cæsarian section is perhaps the most satisfactory, and next to it the application of the De Ribs bag in suitable cases. In regard to the other methods of delivery it may be said as a general principle, that in placenta prævia our intervention must be prompt but the actual delivery must be slow. There is everything to be gained by delay, once the bleeding has been controlled, for the patient is given time to recover from the shock and collapse and she is less exposed to the risks of hæmorrhage, laceration, sepsis and collapse. For the fœtus also the complications incidental to rapid delivery are prevented.

A comparison is generally made between the hydrostatic dilator and the Braxton Hicks method, and it has been generally claimed for the former that it is more favourable for the fœtus inasmuch as it helps to retain the liquor amnii, serves to dilate the cervix fully and uniformly before expulsion of the fœtus, does not necessitate the exposure or compression of any part of the fœtus before it is expelled, and further stimulates uterine contractions.

On the other hand in cases where version is performed there are certain obvious advantages. No special instrument or apparatus is needed and very often no anæsthetic, so that in general practice it will still form the chief method of treatment. Moreover, continued pressure on the placental site is secured. Jellet records that of 264 cases so treated the maternal mortality of placenta prævia was 5·3 per cent, including moribund

patients, and 3 per cent if they were excluded. Conrad has a maternal mortality of 11·6 per cent using the bag, and 7·6 per cent from version. He found the fœtal mortality was 50 per cent by version, and 16·3 per cent with the bag. There were no maternal deaths in the St. Bartholomew's Hospital series treated by the bag but the fœtus was still-born in every case. It may be stated that the De Ribs bag, while it is useful and ought to be resorted to in certain cases, is not desirable and may not be available in others. In premature deliveries at the eighth month, where the condition of the fœtus is not good or where the patient has lost much blood, the De Ribs bag is not a satisfactory method of treatment.

The question of cæsarian section in placenta prævia yet remains to be considered. Of late this operation has been very popular and the furore is so great that it has led to a great deal of searching of heart amongst obstetricians of eminence. There are those who would advocate cæsarian section for every imaginable cause, from the pangs of childbirth to the convulsions of eclampsia. The incidence of cæsarian varies in different institutions from 1 in 50 to 1 in 200. It may be generally stated that the greater the number of cæsarians performed by an obstetrician, the less is he competent to arrive at a sound obstetric judgment.

So far as placenta prævia is concerned it may be said that cæsarian section is undoubtedly of value from the maternal and fœtal points of view, if it is performed on elderly primigravidæ, and particularly in cases of central

placenta prævia. It is not suitable if the patient is already suffering from shock and severe hæmorrhage, nor do I think it desirable in premature deliveries or when the condition of the child is doubtful.

Eclampsia.—I now come to the toxæmias of pregnancy and their effect on the fœtus. The chief of these is eclampsia. William records a fœtal mortality 56 to 57 per cent, Eden and Holland 40 to 50 per cent. At the Government Hospital for Women and Children in a series of 220 cases treated here, 221 children were delivered, of whom 142 were born alive, 63 still and 16 macerated. The percentage of still births was thus 35 per cent. The fœtal mortality will depend very much on the maternal mortality and on the nature of treatment and the method of delivery. Our experience in this hospital has been clearly set forth in a paper contributed by Col. Hingston and myself to the Indian Science Congress, Lahore, in January 1927.

I may here quote a passage from the paper referred to above: "We hold that accouchement force should never be adopted in cases of eclampsia and we are definitely of opinion that nothing is to be gained by precipitating labour whatever may be the method employed. Our teaching is to leave the woman alone, so far as labour is concerned except to terminate the second stage of labour earlier without waiting for signs of fœtal distress or maternal distress. Thus we deliver the woman if the os is nearly fully dilated and the membranes ruptured. This we do in the interests of

both mother and child; the mother because the strain on the heart may be severe and a certain amount of hæmorrhage consequent on delivery would relieve it and reduce the blood pressure, the child because we have noted that the longer the fœtus is in the uterus after rupture of membranes the greater is the degree of oligopnœa or asphyxia."

Asphyxia Neonatorum.—I may next touch on the question of asphyxia neonatorum and the best method of reviving the child. The causes of asphyxia are well known but there is one condition the importance of which cannot be exaggerated—intra-cranial injuries—which will be dealt with in greater detail later. I hold that prophylaxis in delivery is the best method of preventing asphyxia. It is not unusual to see a child delivered with the face looking upwards and to keep the child in that position for some time after delivery. A mild compression of the chest as the shoulders are being delivered, with the face looking downwards, will materially help the mucous, and any liquor amnii collected in the mouth or upper air-passage, to escape. On the other hand, if the face is looking upwards there will be a natural tendency for the mucous to gravitate into the upper air-passage.

The method of artificial respiration is also of importance. In our experience Sylvester's method is to be preferred. After the usual precautions about cleaning the mucous from the throat, the child should be kept in a bath with the head elevated and the assistant should know how to support the child in the bath.

There should be no pressure on the trachea or neck, the hand resting against the occiput. The attempts at artificial respiration should follow the natural efforts at breathing and there is no need to do the artificial respiration more than 10 or 12 times a minute. Considerable advantage is also gained by rolling the child on a blanket alternately compressing and relaxing the chest. Injections of Sheilds fluid, adrenaline, and occasionally pituitrin are useful, and brandy as a diffusible stimulant is invaluable and may be rubbed over the chest and in the mouth. Oxygen inhalations, if available, would be very helpful. Intra-cardiac injection of adrenaline chloride has been advocated, but my experience is very limited in this direction.

Birth injuries.—I shall next touch on birth injuries and their effects on the fœtus. Many recent investigations have clearly shown the fact that intra-cranial injury and hæmorrhage is the commonest cause of still birth and neo-natal mortality of the infant. The effect of birth injuries cannot be exaggerated, and several causes of neo-natal mortality which were described as due to atelectasis, hæmorrhagic diathesis, prematurity, hæmorrhage, convulsions, etc., have now been shown by post-mortem findings to be due to intra-cranial injuries. The injuries affecting the contents of the skull, the brain and meninges are most important. Such injuries may be caused by mechanical causes, but there are in the large majority of cases some predisposing factor responsible for the injury. In every normal labour some amount of compression of the skull is inevitable. It is not merely the compression of the bony pelvis or of

forceps that may lead to these injuries, but the soft portions of the birth canal, an incompletely dilated cervix or the rigid perineum of a primipara represent definite mechanical obstacles which may lead to serious intra-cranial injury.

All modern statistics of cephalic birth-injuries point clearly to the etiological significance of prematurity. This fact is generally ascribed to an abnormal fragility of the vessel walls, of the dura and of the brain tissue itself, the result of incomplete development. The premature infant is thus remarkably vulnerable to the traumatism of birth, although in a large number of such cases the labour may be normal and spontaneous.

At one time it was thought that asphyxia was a direct cause of brain injuries and the congested condition of the injured sinus or veins was likely to lead to rupture. To-day, however, the opinion is widely prevalent that the asphyxia is rather the result than the cause of the intracephalic lesion.

In a large number of cases the very obvious cause for the intra-cranial lesion is an external cranial trauma, evidenced by a deep indentation or a guttered fracture. Almost without exception these infants succumb immediately to the injury. Of much greater practical importance are internal injuries not so clearly noted by external evidence. In the majority of such cases, the responsible mechanical cause is recognized in definite anomalies of labour—breech, extraction of the head after version, difficult forceps extraction. There still remains a fairly large percentage of cases where the labour is easy,

spontaneous, often precipitate, the child small, frequently premature. Asphyxiation, and especially prematurity, render the infant abnormally susceptible to the trauma even of normal labour, and thus predispose it to serious injury.

Cerebral hæmorrhages should be borne in mind under the following conditions:—

(1) When an infant is born asphyxiated.

(2) When an infant breathes sluggishly.

(3) When an infant refuses to nurse satisfactorily.

(4) Where there are convulsions or twitchings.

(5) When hæmorrhage occurs from the mouth or the rectum.

(6) When the infant is drowsy and has a feeble or an extremely sharp cry.

(7) When the infant shows marked pallor and a rapid loss of weight.

Baumm has made certain interesting observations with regard to the possible value of variations in the rate of the fœtal heart in the diagnosis of intra-cranial hæmorrhage. From a large series of careful observations on parturient women combined with an autopsy study of all still-born infants, Baumm concludes that a fœtal tachycardia, apparently without a preliminary bradycardia, in the course of a protracted labour in an afebrile woman, is pathognomonic for a threatened intra-cranial hæmorrhage. Baumm believes that the timely discovery of this symptom in some cases might enable the physician

to save the child by quick delivery. Baumm furthermore concludes from his observations that a tachycardia preceded by a bradycardia is rather suggestive of the fact that the hæmorrhage has already occurred. No hope to save the child is held out by prompt delivery.. These opinions are particularly interesting in view of the observations I have already made regarding the fœtal prognosis with a rapid or slow fœtal heart. Baumm further holds that the reversed sequence of a tachycardia followed by a bradycardia is probably the expression of a commencing mechanical asphyxiation. I may however add that other obstetricians do not hold this view, E. Sachs, for instance, maintaining that fœtal heart below 100 is far more ominous than one above 160. The subject obviously requires further investigation, specially along the lines of Baumm.

Prematurity.—I now come to some of the other causes of neo-natal mortality. Of these prematurity stands foremost. The question obviously arises: What are the causes of prémature delivery? The occurrence of premature birth depends upon many causes, which may be divided into those which result in the expulsion of a healthy premature infant, and those which have a damaging effect on the infant. In the first class may be included various injuries, falls, lifting of heavy weights, overwork or other physical exhaustion and emotional causes. In some cases premature labour may be due to operations on the mother for conditions such as ovarian cysts, fibroids, appendicitis, etc. In regard to the second class, the most frequent causes are the chronic infections. Syphilis plays the leading role and is estimated as being

a factor in from 50 to 80 per cent of all cases of repeated premature expulsion of the fœtus. Chronic nephitis is also another common cause of spontaneous premature labour. Pulmonary tuberculosis is said to lead to premature labour occasionally. Premature birth is said to occur in 30 or 35 per cent of the cases of broken compensation in heart disease. Any of the acute infectious diseases may be responsible for the termination of pregnancy before the end of term. Pneumonia, influenza, typhoid fever, malaria, diphtheria, smallpox, Asiatic cholera and plague, have all a deleterious effect on the continuance of pregnancy. Premature labour is very common in pneumonia and influenza, being more frequent in late pregnancy.

The occurrence of multiple pregnancy is a fruitful cause of premature labour. About 70 per cent of twin pregnancies terminate prematurely, and triplets and quadruplets are generally born prematurely, in most cases probably because of lack of room in the uterine cavity. The greatest number of premature children die in the first few days of life. This is because of birth trauma, the effect of the maternal diseases, or lack of proper care. I need not go into the other causes of neonatal death at length because most of the causes are not common. Infantile diarrhœa or green diarrhœa, however, has caused a considerable mortality. Careful attempts at investigating into the bacteriological factor concerned have so far proved negative. When green diarrhœa occurs it seems to affect a fairly large number of children.

Age incidence in pregnancy.—I shall now touch on a subject to which brief reference was made in my first

lecture—the age incidence in pregnancy and its effect. I shall place before you the facts such as they are, and the inferences you would draw. Going into this question a little more deeply, I was led to inquire what was the earliest age at which confinement took place and where do we find such early maternities. According to De Lee the earliest authentic pregnancy is reported by Bod. The child was 8 years and 10 months and the baby weighed 3,500 gm. Dorland gives as the earliest instance the case recorded by Tidy of a girl who first menstruated at 4 years and was delivered of a living child when only 8 years of age. Warton and Stille report an instance of a baby menstruating in her first year and being delivered in her ninth year of a child weighing 7¾ lb. Pittman reports the case of a coloured girl aged 9 years 24 days weighing 75 lb. delivered of a 7 lb. baby. Kerns delivered a mother aged 11 years 6 months 21 days. Tacker cites a mother of 11 years 4 months. Scott reports a mother of 12. Harris in 10,000 cases at the Johns Hopkins had only two cases of pregnancy at 12 years. Williams had three cases of pregnancy at 12 years, and six at 13 years. In each instance there were twice as many negroes as whites.

Howard Dittrick, visiting obstetrician of "The Retreat" in Cleveland from whose article in the *Journal of the American Medical Association*, the above statement is quoted, reports that at The Retreat in Cleveland where the patients are all whites, in 3,321 births since 1869, there were six confinements at 13 years or under. Fairbain in his textbook on gynæcology and obstetrics says, "pregnancy in girls not yet in their teens is met

with now and then in this country; among the latin races in South America it is said to be not uncommon."

This table gives the age incidence of pregnancy in over 64,000 confinements at the Government Maternity Hospital. It will be noticed that there were 2 cases at the 12th year; 18 at the 13th year; 87—14th year; 307—15th year; It would thus be seen that while undoubtedly what would be termed "precocious pregnancy" in other countries and what we call "early maternity" or child mothers does exist in this country, it is not so common as is ordinarily supposed. The criticism may be levelled that this after all represents hospital practice and that the class of persons among whom the custom of early marriages and consequent early maternity is most in vogue do not resort to the hospital. My own experience may not be sufficient, but I am privileged to quote the experiences of one of our most senior and much respected doctors, Dr. A. M. Macphail, who told me that she had met with only four cases of pregnancy in girls of 13 in her forty years' unrivalled practice in this country.

Let us next see what the effect of early maternity is both on the mother and on the fœtus. From his experience of the cases of "precocious pregnancy" at "The Retreat" Dittrick concludes "the common experience with these early primiparas justified a good prognosis for mother and child. The child is usually small with a soft head, whereas the pelvic bones of the mother are more yielding than in later life and the soft parts exhibit greater elasticity. It follows then, that in borderline cases of pelvic deformity, a test of labour is advisable,

and that many, who at a mature age would require operative interference, will deliver spontaneously. Cæsarian section will be rarely indicated. The old adage that 'meddlesome midwifery is bad' is especially applicable here. As Harris points out, from a purely obstetric point of view these ages appear to be the optimal time for the occurrence of labour." With much of what Dittrick has said I am inclined to agree from my own experience, although I would not go the length of stating that a good prognosis is justified, much less that it is the optimal time for labour, as Harris opines. Lundh Gosta, writing on "The problem of age and primiparity" in the *Scandinavian Journal of Gynæcology*, summarizes his result of the analysis of 7,000 first labours.

(1) Late onset of menstruation is correlated with late commencement of child-bearing.

(2) During pregnancy it is only the toxæmias which show a moderate increase in the oldest classes, and possibly a slight increase in the youngest.

(3) The tendency to premature labour is greatest in the youngest primipara.

(4) There is a definite optimum for the duration of labour around the 22nd year, with a range of 2 to 3 years on either side. In older patients and in the very young, labour is prolonged.

(5) The causes of this proven prolongation with age are considered to be the more frequent occurrence of

complications, such as contracted pelvis, malpresentations, premature rupture of membranes, inadequate pains, and rigidity of soft parts.

(6) Among other complications of labour, chiefly eclampsia shows a definite increase in the elderly classes and to some extent in the youngest classes.

(7) There is a prolongation of the third stage of labour in the elderly. The youngest mothers also show a slight prolongation of this stage.

(8) Age does not seem to exercise any influence whatever upon the weight, length and head dimensions of the children; nor does it appear to influence the sex. The frequency of twins rises with the maternal age.

(9) The maternal mortality in the puerperium shows no definite influence from age. As regards the mortality a certain influence from age cannot be excluded, especially in respect of deaths from eclampsia.

(10) The increase in the risk is still greater in women who have been married rather long becoming pregnant.

The accompanying graph shows the classification of labour according to age. The labours are natural, difficult, preternatural, eclampsia and rupture of uterus. It will be noticed that both cases of labour ended as difficult in the 12th year. From the 13th almost up to the 19th year, the complicated cases are proportionately greater than at other age-periods. Thus in the 13th year 45 per cent of labours ended naturally, while 24 per cent ended as difficult, 16 per cent ended as

preternatural and 16 per cent in eclampsia—a very heavy incidence. Similarly the incidence is relatively great almost up to the 19th year. From the 20th to the 29th or 30th year the proportion of natural labours is greater, almost 90 per cent, while the complications are very much less. From the 30th age difficult labour is on the increase, and even preternatural labour is more. Eclampsia is not so common in this period. Rupture of the uterus is comparatively rare in the early years but shows an increase from the 24th year, being particularly marked in 31, 33, 34, 37, 39 and between 42 and 50. There were no cases of rupture before the 16th year.

The next chart that is before you is a statement showing the details of delivery of 175 cases in the ages of 13, 14, 15 in nearly 10,000 confinements that took place in this Hospital. One hundred and sixty-five of these were primipara and 10 multipara; of the 5 cases at the 13th year, 4 ended naturally and 1 was an abortion; 3 children were born alive and 1 still birth. The average weight was $4\frac{15}{16}$ lb.

In the age of fourteen 73·53 per cent ended naturally and there were 4 abortions. Eighty-five per cent of the children were born alive. In the age of 15 there was only 61 per cent of natural labours, while the number of children born alive was 78 per cent. 7·43 per cent of the cases developed eclampsia. From these satistics it is obvious that there is a far greater incidence of abnormalities during this period, and while the weight of the child is not very much less, it is still below the average weight of an Indian child, which is about 6 lb.

The next table shows you the percentage of maternal deaths to total mortality and number of cases at different age-periods for ten years. It will be seen that the percentage of mortality is greater below 20 or above 30, and although there were only 3,911 cases admitted the precentage mortality on total deaths is 26·3.

Age in years.	Total no. of cases.	Total no. of deaths.	Aver. % mortality on total deaths.	Aver. % mortality on total no. of cases.
Below 20 ..	3,911	125	26·3	3·43
20—24 ..	5,040	139	29·3	2·76
25—29 ..	3,302	97	20·5	3·1
Above 30 ..	2,731	113	23·8	4·6

The next table is the one which shows the mortality of deaths according to parity. As is to be anticipated there is a greater mortality among primipara than amongst the other groups, and even in regard to the total number of deaths it is as high as 37 per cent. It shows the risks incidental to pregnancy and labour, part of which is caused by the special complications such as toxæmias, and part of which is due to the age incidence of pregnancy.

Pregnancy.	Total no. of cases.	Total no. of deaths.	Aver. % mortality on total deaths.	Aver. % mortality on total no. of cases.
I ..	4,008	175	37	4·36
II ..	2,870	60	11·8	2·1
III ..	2,326	65	13·5	2·8
IV ..	1,636	44	9·3	2·8
V—XV ..	4,191	129	27 5	3·1

A question intimately connected with this question of early maternity is the effect of labour on old primipara. The term "old primipara" is usually applied to women who become pregnant for the first time after their 30th year. During the time of the World War the number of old primipara delivered in the clinics was nearly doubled, and since the War has remained at about the same level in Europe. Old primipara constituted about 6 per cent of all pregnant women and 11 per cent of all primipara in Frankfort. From a review of 519 cases of old primipara seen during the period 1917—22, Hamucke draws the following conclusions: "Organic injuries due to pregnancy, especially injuries of the kidneys, are found more frequently in old than in young primipara. The incidence of eclampsia in the former is 2·12 per cent while in the latter it is only 1·29 per cent. Miscarriages occur twice as often in the former as in the latter. Defective expulsion power, especially weakness of labour pains, complicate 10 per cent of the labours of the old primipara, but only 4 per cent of those of young primipara. Premature and early rupture of the membranes and hæmorrhages due to atony occur in 11·75 and 5·39 per cent respectively of old primipara but in only 2·83 and 3·34 per cent respectively of young primipara. Disturbances in the separation of the placenta also occur more often in the former than in the latter.

Lacerations of the perineum occur in 34·49 per cent of old primiparæ in contrast to 21·21 per cent of young

primiparæ. Lacerations of the second and third degree increase in frequency with advancing age mainly because of increasing rigidity of the soft parts. Anomalies of position were found in 9 per cent of old primiparæ, but in only 4 per cent of young primiparæ. The average duration of labour of the former is about three and one-half hours longer than that of the latter. The frequency of operation in cases of old primipara is about three times that in cases of young primipara. In addition, the mortality and morbidity percentages for both the mother and the child is 3 per cent greater in the former than in the latter."

From these findings, the conclusion is drawn that the prognosis regarding the course of pregnancy, labour, and the puerperium is less favourable for old primiparæ than for women undergoing their first pregnancy in early years.

From the above graphs, statements and quotations it is obvious that early maternity is a danger to the mother and child, and late maternity is also a matter of some gravity attended with even greater complications.

This brings these lectures almost to a close. My object, as I have already stated, was to create some interest in this problem of infantile mortality and to concentrate the attention of the medical profession to a more intensive study of the problems associated with infantile mortality.

How far I have succeeded in doing so and whether I have succeeded at all is a matter for the future to answer.

"Lest we forget" were three moving words which convulsed nations into activity in the Great War. May it not be that the stigma of this heavy infantile mortality that attaches itself to this country, and the silent appeal of the infants themselves would be an incentive as great as the moving appeal of the World War?

The work on which I entered has revealed to me another great possibility. Little did I realize the wealth of clinical material at our disposal, and the great use to which they can be put in research. The kind and generous response that I met at the sister maternity institutions in the city makes me hope that in future there will be a greater co-ordination between these great lying-in-hospitals, and we in Madras will be in a position to give unto the world the results of our work and our research alike to the benefit of the science and the glory of the institutions concerned. May I not also hope that in such a laudable undertaking neither personnel nor funds will be lacking, and that ere long we shall have in Madras not only a great teaching centre but a useful research institution where those who thirst after obstetric wisdom will be able to quench their thirst?

It only remains for me to express my great indebtedness to the many kind friends who have helped me in this work. To them I can never adequately express what I feel, but I have the consolation that even so they will understand me for my silence and the humility with which I express my thanks.

Govt. Hospital for Women and Children, Madras.

Table I.

Total number of deliveries and percentage of maternal mortality.

	Total number of deliveries.	Maternal mortality.	Percentage of maternal mortality.
1910 ...	2,007	47	2·3
1911 ...	2,161	47	2·1
1912 ...	2,173	45	2·07
1913 ...	2,236	37	1·6
1914 ...	2,251	69	3·1
1915 ...	2,118	49	2·3
1916 ...	2,542	52	2·1
1917 ...	2,557	45	1·8
1918 ...	2,450	61	2·5
1919 ...	2,554	64	2·5
1920 ...	2,702	57	2·1
1921 ...	2,468	55	2·2
1922 ...	2,728	66	2·4
1923 ...	2,768	72	2·6
1924 ...	2,903	67	2·3
1925 ...	2,923	68	2·3
1926 ...	2,798	70	2·5
1927 ...	3,100	43	1·4

Table II.

Percentage of maternal mortality and percentage of still births.

	Maternal mortality percentage on total number of deliveries.	Still births percentage on total number of births.
1910 ...	2·3	7
1911 ...	2·1	13·4
1912 ...	2·07	6·7
1913 ...	1·6	5·8
1914 ...	3·1	7·1
1915 ...	2·3	6
1916 ...	2·1	5·4
1917 ...	1·8	6·8
1918 ...	2·5	5·2
1919 ...	2·5	5·6
1920 ...	2·1	7·4
1921 ...	2·2	7
1922 ...	2·4	6·9
1923 ...	2·6	6·7
1924 ...	2·3	7·1
1925 ...	2·3	6·4
1926 ...	2·5	6·04
1927 ...	1·4	5·7

Table III.

Total number of births, percentage of still births, percentage of macerated fœtus, percentage of neo-natal mortality.

	Total no of births.	Still births total.	Percentage.	Total no. macerated.	Percentage.	Total no. of neo-natal mortality.	Percentage.
1910 ...	2,002	141	7	34	1·7	81	4
1911 ...	2,136	286	13·4	45	2·16	88	4·1
1912 ...	2,162	146	6·7	44	2·03	84	3·7
1913 ...	2,186	127	5·8	50	2·2	83	3·7
1914 ...	2,199	156	7·1	62	2·4	99	4·5
1915 ...	2,083	125	6	66	3·17	95	4·7
1916 ...	2,491	135	5·4	43	1·8	101	4·1
1917 ...	2,441	165	6·8	53	2·2	97	4
1918 ...	2,396	122	5·2	49	2·1	125	5·3
1919 ...	2,440	136	5·2	41	1·7	116	4·8
1920 ...	2,625	193	7·4	56	2·15	119	4·5
1921 ...	2,387	164	7	46	1·8	249	10·3
1922 ...	2,611	179	6·9	51	1·1	208	7·7
1923 ...	2,658	181	6·7	61	2·56	227	8·5
1924 ...	2,832	202	7·1	48	1·3	202	7·1
1925 ...	2,844	181	6·4	80	2·3	153	5·3
1926 ...	2,698	...	6·04	...	2·82	121	4·4
1927 ...	2,914	175	5·7	72	2·4	189	6·1

Ramasawmy Mudaliar's Lying-in-hospital.

Table IV.

Percentage of maternal mortality and percentage of still births.

	Maternal mortality cases.	Percentage.	Percentage of still births.
1915 ...	18	1·9	7·2
1916 ...	16	1·2	7·0
1917 ...	24	1·8	6·8
1918 ...	28	2·4	10·2
1919 ...	39	2·9	6·0
1920 ...	31	1·9	8·2
1921 ...	45	3·0	10·7
1922 ...	37	2·1	9·3
1923 ...	48	2·5	7·3
1924 ...	44	2·4	9·4
1925 ...	49	2·4	9·1
1926 ...	31	1·9	10·5
1927 ...	...	...	...

Ramasawmy Mudaliar's Lying-in-hospital.

Table V.

Total number of births, percentage of still births, percentage of macerated fœtus and percentage of neo-natal mortality.

	Total no. of births.	Still births total.	Percentage.	Macerated total.	Percentage.	Neo-natal mortality total.	Percentage.
1915 ...	907	65	7·2	16	1·8	18	2·0
1916 ...	1,274	99	7·0	39	3·1	37	2·5
1917 ...	1,325	90	6·8	28	2·1	47	3·6
1918 ...	1,146	110	10·2	20	1·7	53	4·6
1919 ...	1,314	79	6·0	27	2·1	58	4·4
1920 ...	1,565	129	8·2	27	1·7	59	3·8
1921 ...	1,475	158	10·7	38	2·6	45	3·1
1922 ...	1,735	161	9·3	38	2·2	70	4·0
1923 ...	1,704	124	7·3	30	1·8	78	4·6
1924 ...	1,610	159	9·4	43	2·7	88	5·5
1925 ...	1,962	178	9·1	40	2·0	61	3·1
1926 ...	1,538	162	10·5	20	1·3	70	4·5
1927 ...	...	...	...	...	...	...	...

Ramasawmy Mudaliar's Lying-in-hospital.

Table VI.

Total deliveries and percentage of maternal mortality.

	Total no. of deliveries.	Maternal mortality: number of cases.	Percentage.
1915 ...	937	18	1·9
1916 ...	1,297	16	1·2
1917 ...	1,351	24	1·8
1918 ...	1,175	28	2·4
1919 ...	1,343	39	2·9
1920 ...	1,596	31	1·9
1921 ...	1,524	45	2·95
1922 ...	1,776	37	2·1
1923 ...	1,747	43	2·5
1924 ...	1,847	44	2·4
1925 ...	2,047	49	2·4
1926 ...	1,601	31	1·9
1927 ...	...	...	...

Ramasawmy Mudaliar's Lying-in-hospital.

Table VII.

Percentage of forceps, percentage of still births contributed by forceps and percentage of total still births.

	Total no. of forceps.	Percentage on total deliveries.	Still births from forceps total 3.	Percentage of (3) to total deliveries.	Percentage of total still births.
1915 ...	65	6·9	...	...	7·2
1916 ...	61	4·7	8	0·6	7·0
1917 ...	76	5·6	12	0·9	6·8
1918 ...	...	...	...	...	10·2
1919 ...	63	4·7	13	1·0	6·0
1920 ...	71	4·5	15	1·0	8·2
1921 ...	101	6·6	21	1·4	10·7
1922 ...	153	8·6	27	1·6	9·3
1923 ...	80	4·6	8	0·5	7·3
1924 ...	80	4·3	10	0·6	9·4
1925 ...	65	3·2	...	...	9·1
1926 ...	84	5·3	17	1·1	10·5
1927 ...	...	...	...	...	...

Govt. Hospital for Women and Children.

Table VIII.

Percentage of forceps, percentage of still births due to forceps and percentage of total still births.

	Forceps total.	Percentage.	Percentage of still births in forceps to total no. of births.	Percentage of total still births to total no. of births.
1910 ...	197	10	2·3	7
1911 ...	202	9·7	2·1	13·4
1912 ..	219	10·8	2·03	6·7
1913 ...	236	10·5	1·2	5·8
1914 ...	185	8·2	1·2	7·1
1915 ...	162	7·7	1·8	6
1916 ...	287	7	1·8	5·4
1917 ...	233	9·3	1·6	6·8
1918 ...	219	8·9	1·4	5·2
1919 ...	229	9	1·1	5·6
1920 ...	241	8·9	1·4	7·4
1921 ...	339	13·6	2·1	7
1922 ...	400	14·7	2·2	6·9
1923 ...	408	15·7	1·5	6·7
1924 ...	372	13·4	1	7·1
1925 ...	324	11·1	1·3	6·4
1926 ...	258	9·1	...	6·04
1927 ...	358	11·5	...	5·7

Table IX (a).

Percentage of maternal deaths to total mortality and number of cases with regard to age at different age-periods, for ten years.

Age in years.	Total number of cases.	Total number of deaths.	Average % mortality on total deaths.	Average % mortality on total number of cases
Below 20	3,911	125	26·3	3·43
20 — 24	5,040	139	29·3	2·73
25 — 29	3,302	97	20·5	3·1
Above 30	2,731	113	23·8	4·6

Table IX (b).

Percentage of maternal deaths to total mortality and number of cases with regard to pregnancy for ten years.

Preg-nancy.	Total number of cases.	Total number of deaths.	Average % mortality on total cases.	Average % mortality on total deaths.
I	4,008	175	37	4·36
II	2,870	60	11·8	2·1
III	2,326	65	13·5	2·8
IV	1,636	44	9·3	2·8
V to XV	4,191	129	27·5	3.1

Forceps Cases.

	Total deliveries.	Forceps.	Forceps. percentage.	% of Infant mortality (still births & macerated fœtus).
London Maternity Hospital ; (15 years.)	17,738	1,336	7·7	10·8
G. M. H. (1916—1925) (10 years)	26,630	2,865	10·7	12
Ramisawmy (10 years) ..	17,072	890	5·1	15·8
Queen Charlotte ..	..	1,800	..	6
Rotunda Purefoy ..	11,098	431	3·8	18·92
Montreal Maternity ..	15,000	186	1·2	16·6

FOETAL MORTALITY IN BREECH DELIVERIES.

Textbooks.	Hospital practice. Hospital.	Total cases.	Fœtal mortality.	Neo-natal mortality.
Eden and Holland .. 10% (Primi).	Jessop (Sheffield) ..	50	34%	6%
Ten Teachers .. 3·39 to 10%.	Queen Charlotte ..	51	36%	2%
Aleck Bourne .. 11% (Primi) 3·39° (Multi).	Leeds Maternity ..	156	25%	12·19%
Cameron and Hewitt. 12% „ 4% „	Birmingham	52	40·4%	13·4%
Williams .. 10 to 15% 3.3%.	St. Mary's, Manchester ..	74	33·7%	11·3%
Fairbain .. 10% 3 to 4%.	Liverpool	63	23·8%	4·7%
	Rotunda, Dublin ..	700	23·8%	?
	Govt. Hospital for Women and Children ..	812	21·8%	11·2%

MATERNAL AND FOETAL MORTALITY IN PLACENTA PRAEVIA.

Institution.	Cases.	Maternal mortality.	Fœtal mortality.	Neo-natal mortality.
Montreal Maternity. (Braxton Hicks Method)	22	Nil.	80·95	—
Queen Charlotte. (Plugging—Central)	22	9·1%	63·7%	27·3
(„ —Lateral)	17	11·7%	52·9%	23·5
Cæsarean Section—				
Edinburgh Royal Maternity	14	7·20	7·20	—
Montreal Maternity	12	16·67	33·14	—
All Methods—				
Edinburgh Royal Maternity	254	9·8	64%	—
Karlsruhe Clinic	172	9·30	52%	—
Boston Lying-in-hospital	92	19·56	55·0	—
New York Lying-in-hospital	591	12·10	60·0	—
Chicago	70	1·30	28·0	—
Johns Hopkins	66	10·60	72 0	—
Rotunda (Jellet)	—	—	—	—
Govt. Hospital for Women and Children	93	22·5	66·6	11·8
Raja Sir Ramasawmy Mudaliar Hospital	84	..	65·5	4·8%

STATISTICS FOR 1927.

Government Victoria Caste and Gosha Hospital.

1. *Total number of confinements for the year:—1,891.*

2. Total number of still births 157

3. Causes of still births .. ..

I. Consequent on labour		
(*a*) Abnormal presentations ..	..	9
(*b*) Prolapsed cord ..	..	6
(*c*) Prolonged labour (Forceps vertex)	..	20
(*d*) Prolonged labour (Natural vista)	..	14
(*e*) Ante-partum hæmorrhage ..	..	11
Total	..	60
II. Maternal causes		
(*a*) Eclampsia ..	..	8
(*b*) Pre-eclamptic toxæmia ..	..	8
(*c*) Anæmia of pregnancy ..	..	3
(*d*) Fevers, pneumonia, etc. ..	..	6
Total	..	25
III. Macerated fœtuses		
(*a*) Syphilitic ..	..	6
(*b*) Syphilitic ? ..	..	22
(*c*) Probably not syphilitic ..	..	6
Total	..	34
IV. Prematurity		
(*a*) Twins ..	..	5
(*b*) Cause not made out ..	..	25
Total	..	30
V. Undefined causes.		8
Total	..	157

4. Neo-natal mortality

A. Number of infants dying within ten days	..	85
B. Causes of such deaths.		
1. Prematurity ..	..	38
2. Syphilis ? ..	..	2
3. Prolonged labour and fœtal asphyxia ..	..	17
4. Septic cord ..	..	1
5. Imperforate anus ..	..	1
6. Infantile diarrhœa .	..	2
7. Infantile convulsions ..	..	1
8. Cause not ascertained (no records available) ..	..	23
Total	..	85

STATISTICS FOR 1927.

Government Hospital for Women and Children.

1. *Total number of confinements for the year:—3,100.*

2. Number of still births 247

3. Causes of still births—

i. Consequent on labour.

(*a*) Abnormal presentations	22
(*b*) Prolapsed cord	16
(*c*) Prolonged labour	1
(*d*) Prolonged labour (forceps)	43
(*e*) Rupture of uterus	5
(*f*) Tonic contraction of uterus	1
Total	88

ii. Maternal causes.

(*a*) Ante-partum hæmorrhage	11
(*b*) Eclampsia	7
(*c*) Pre-eclamptic toxæmia	6
(*d*) Anæmia of pregnancy	5
(*e*) Fevers, pneumonia, etc.	3
(*f*) Dysentery & diarrhœa	4
(*g*) Syphilis	2
Total	38

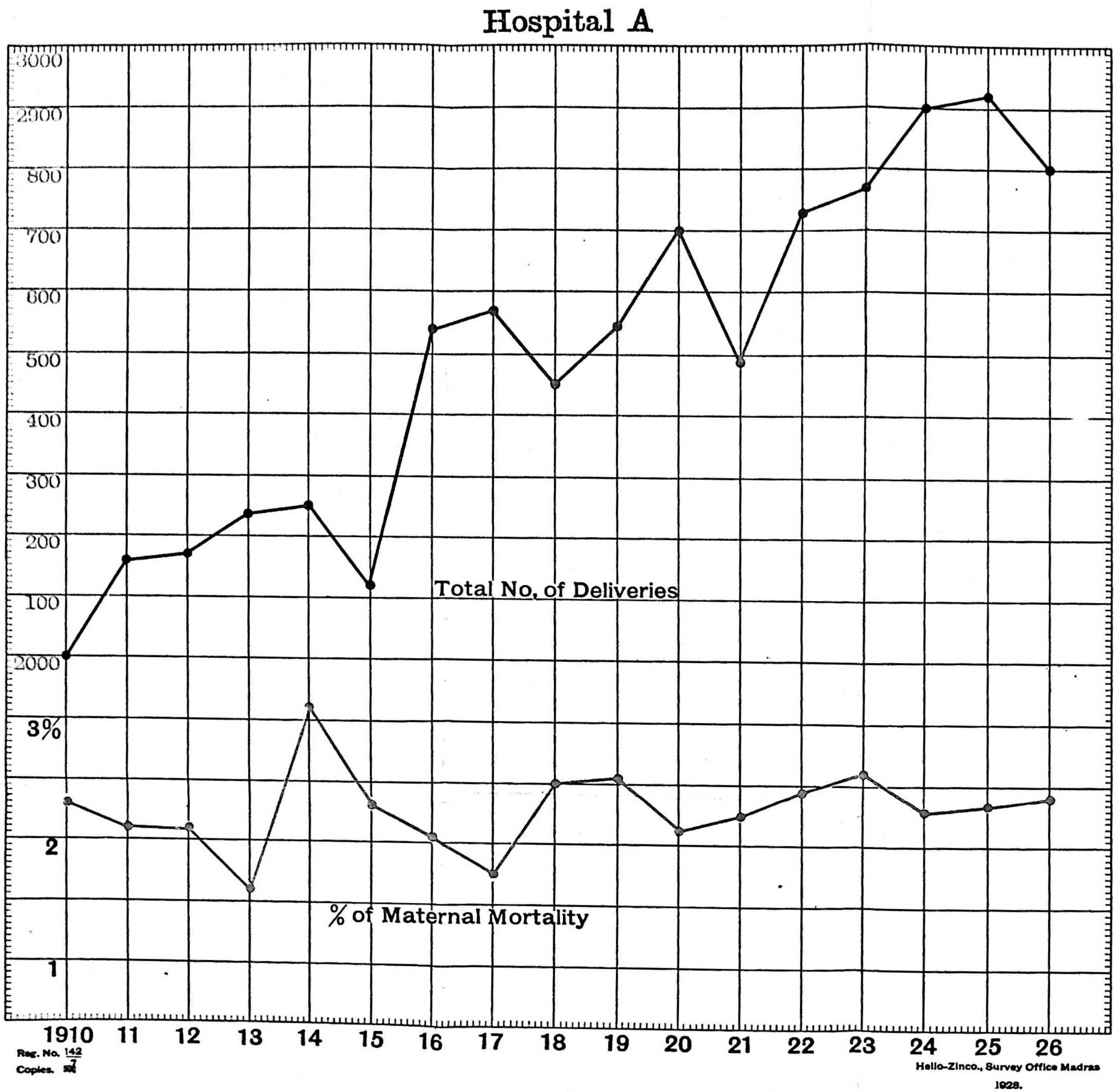
iii. Macerated fœtus	72
iv. Fœtal monstrosity	10
v. Prematurity twins	14
vi. Undefined causes	20

4. Neo-natal mortality

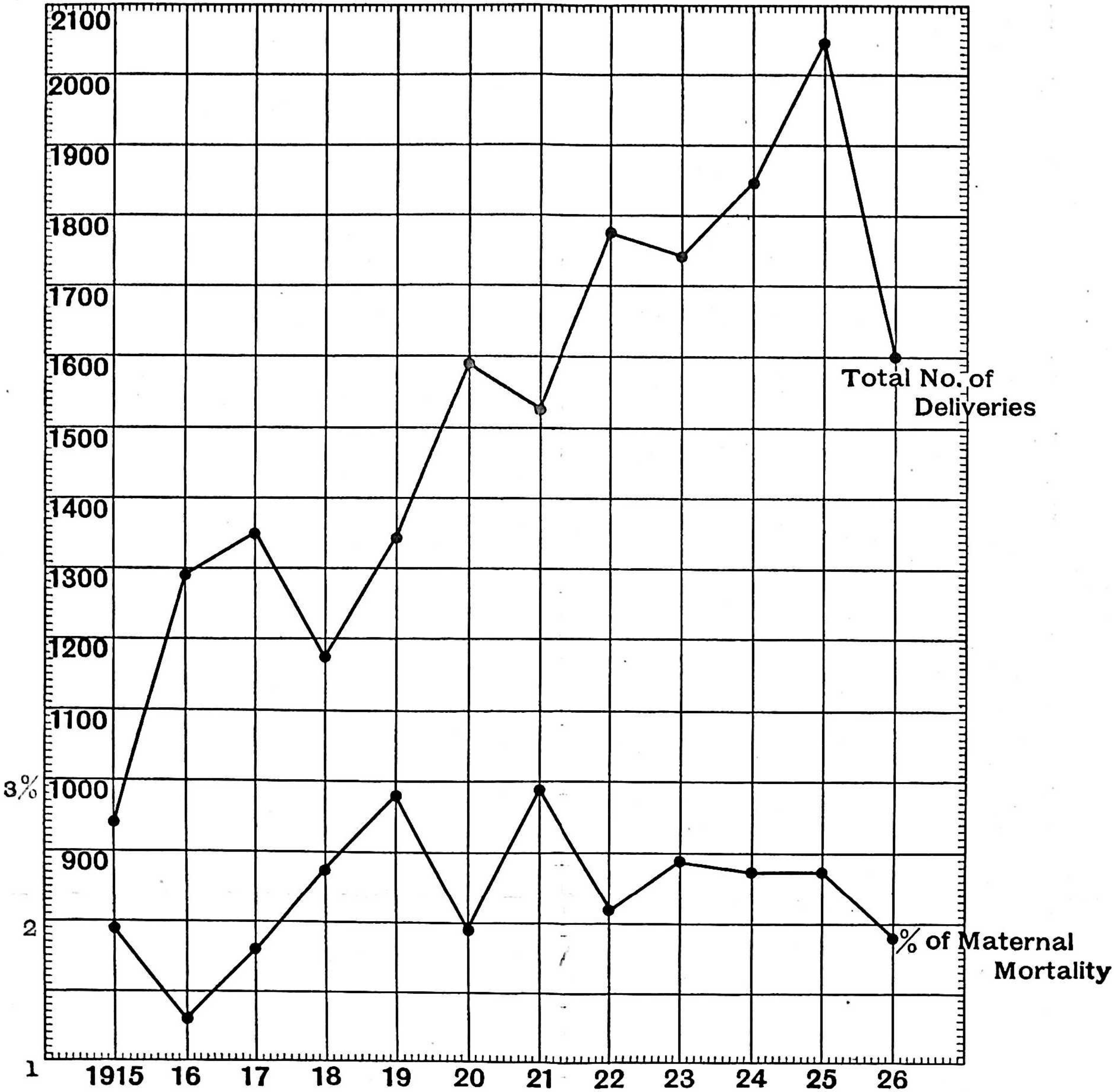
A. Number of infants dying within ten days after birth 189

B. Causes of such deaths—

1.	Prematurity	62
2.	Diarrhœa	35
3.	Debility	16
4.	Atelectasis	12
5.	Convulsions	15
6.	Imperforate anus	4
7.	Head injuries	15
8.	Hæmorrhage of the new born	5
9.	Asphyxia	3
10.	Marasmus	3
11.–12.	Toxæmia of Eclampsia	1
13.	Tetanus	2
14.	Fever	2
15.	Hydrocephalus	1
16.	Jaundice	1
17.	Syphilis	1
18.	Umbilical sepsis	1
19.	Intestinal obstruction	2
20.	Undetermined causes	8
	Total	189


Hospital A
3000
2900
800
700
600
500
400
300
200
100
2000
3%
2
1
Total No, of Deliveries
% of Maternal Mortality
1910
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
Reg. No. 142/7
Copies. 50
Helio-Zinco., Survey Office Madras
1928.

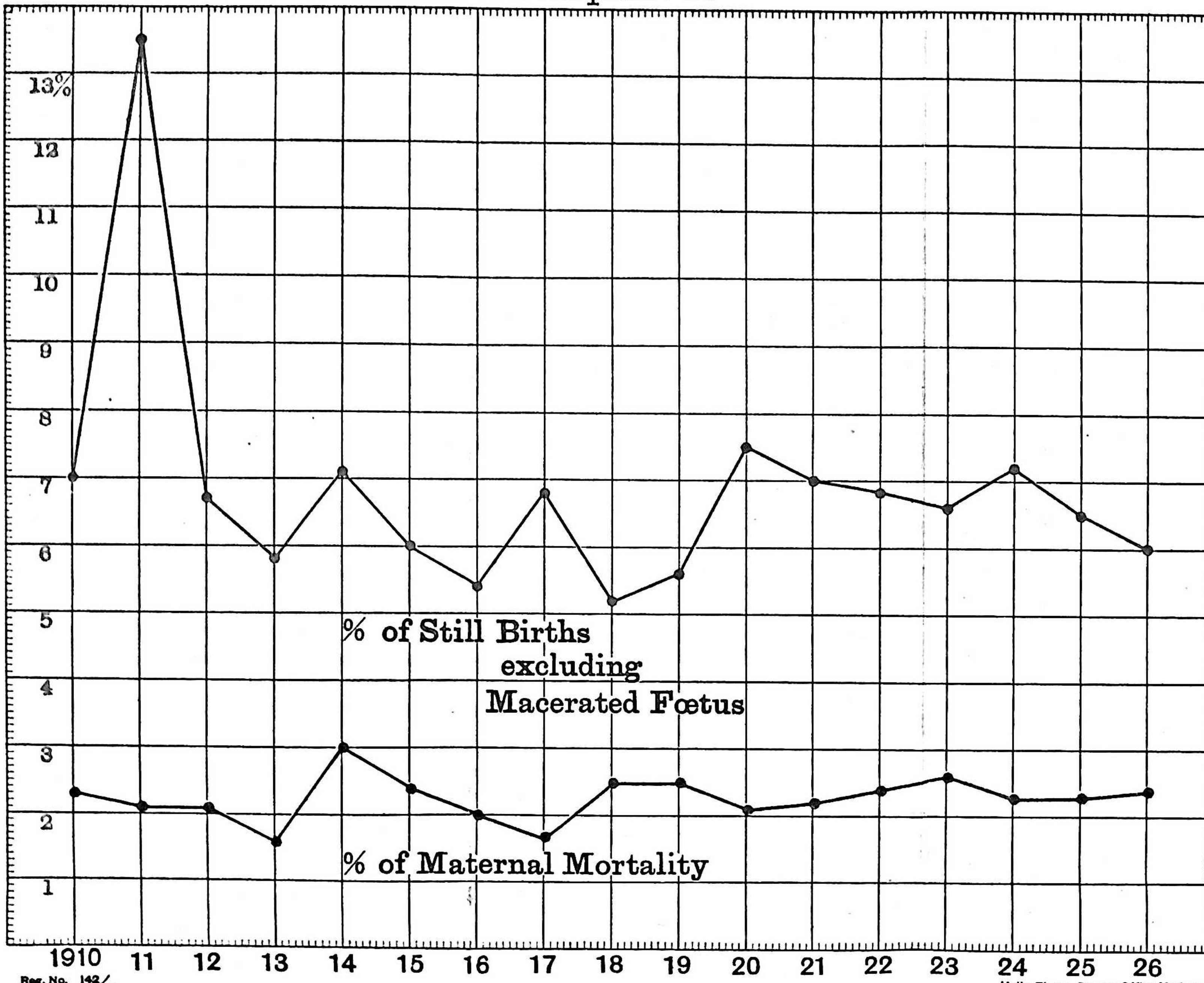
Hospital B



Reg. No. 142/6
Copies. 500

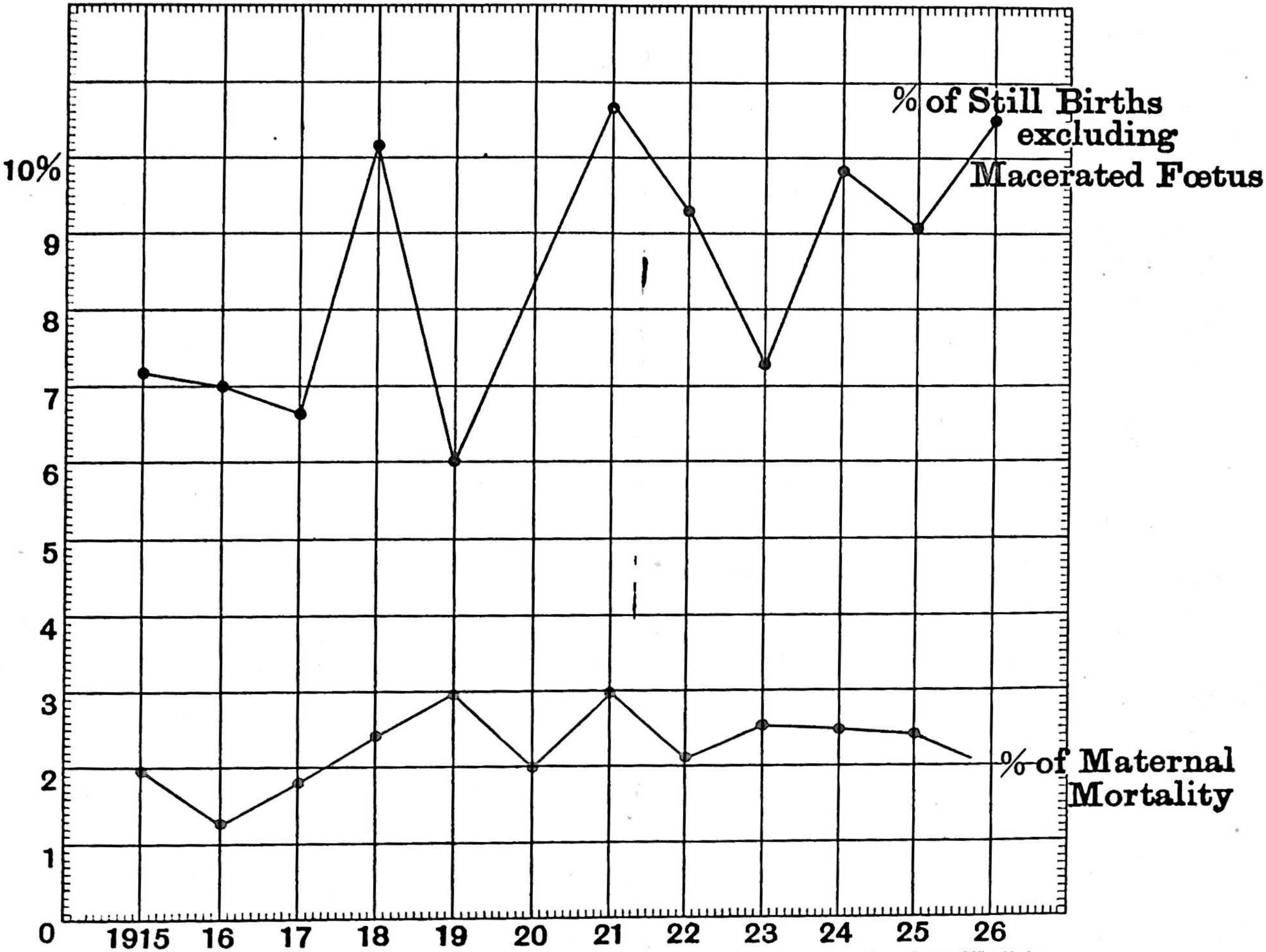
Helio-Zinco., Survey Office, Madras
1928.

Hospital A

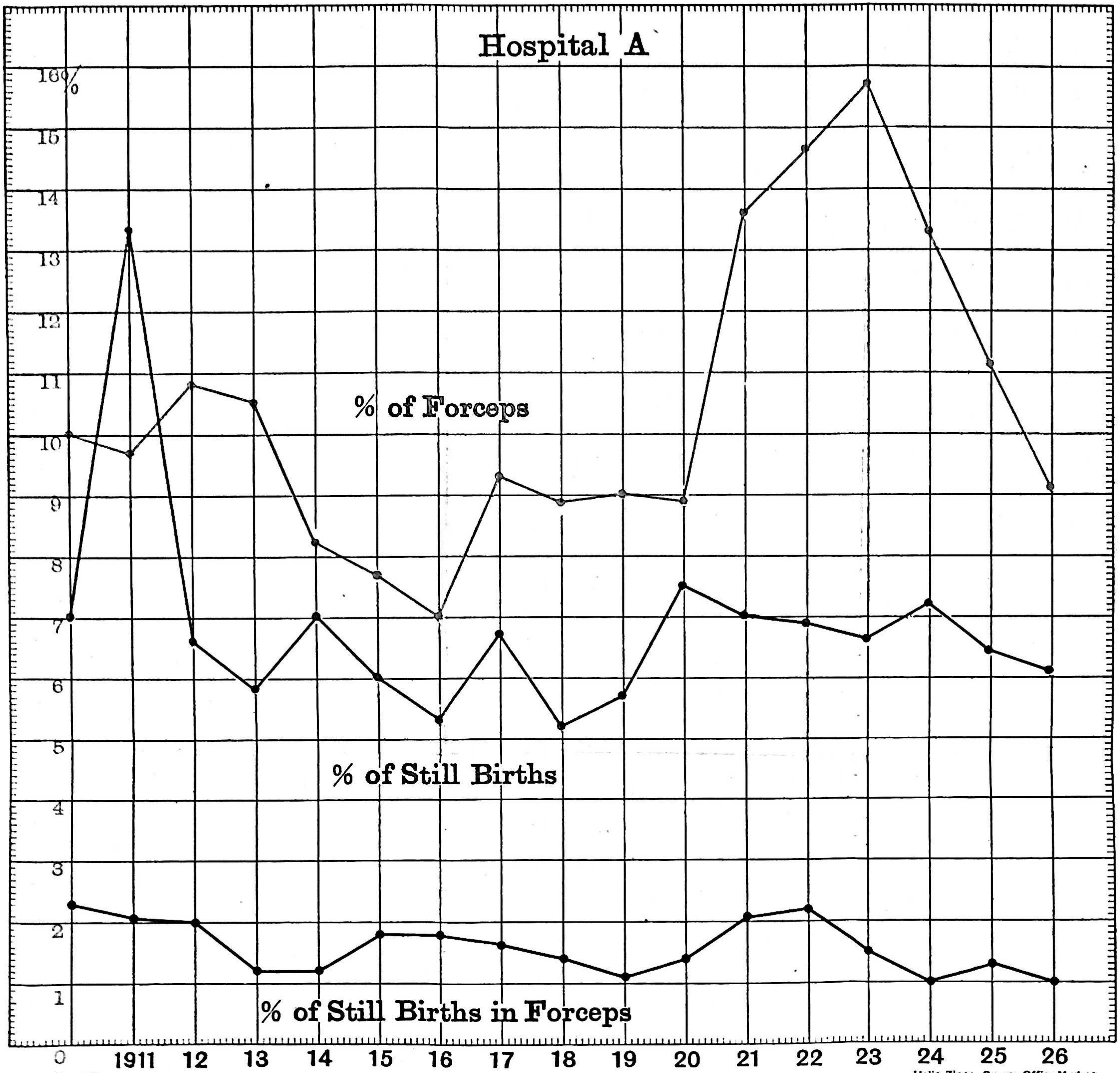


Reg. No. 142/12
Copies. 500
Helio-Zinco., Survey Office Madras
1928.

Hospital B

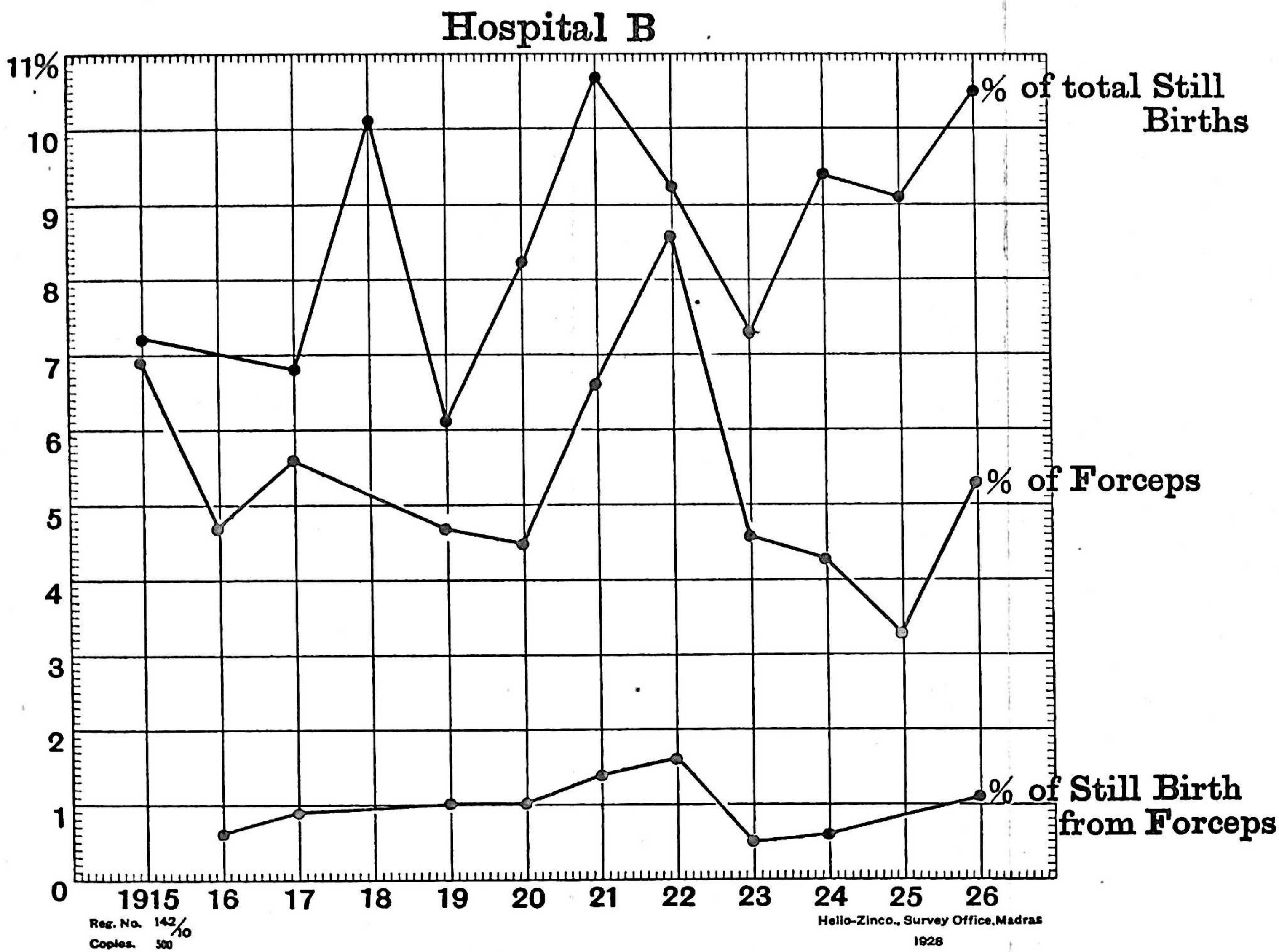


Reg. No. 142/6
Copies. 500
Helio-Zinco., Survey Office, Madras.
1928.

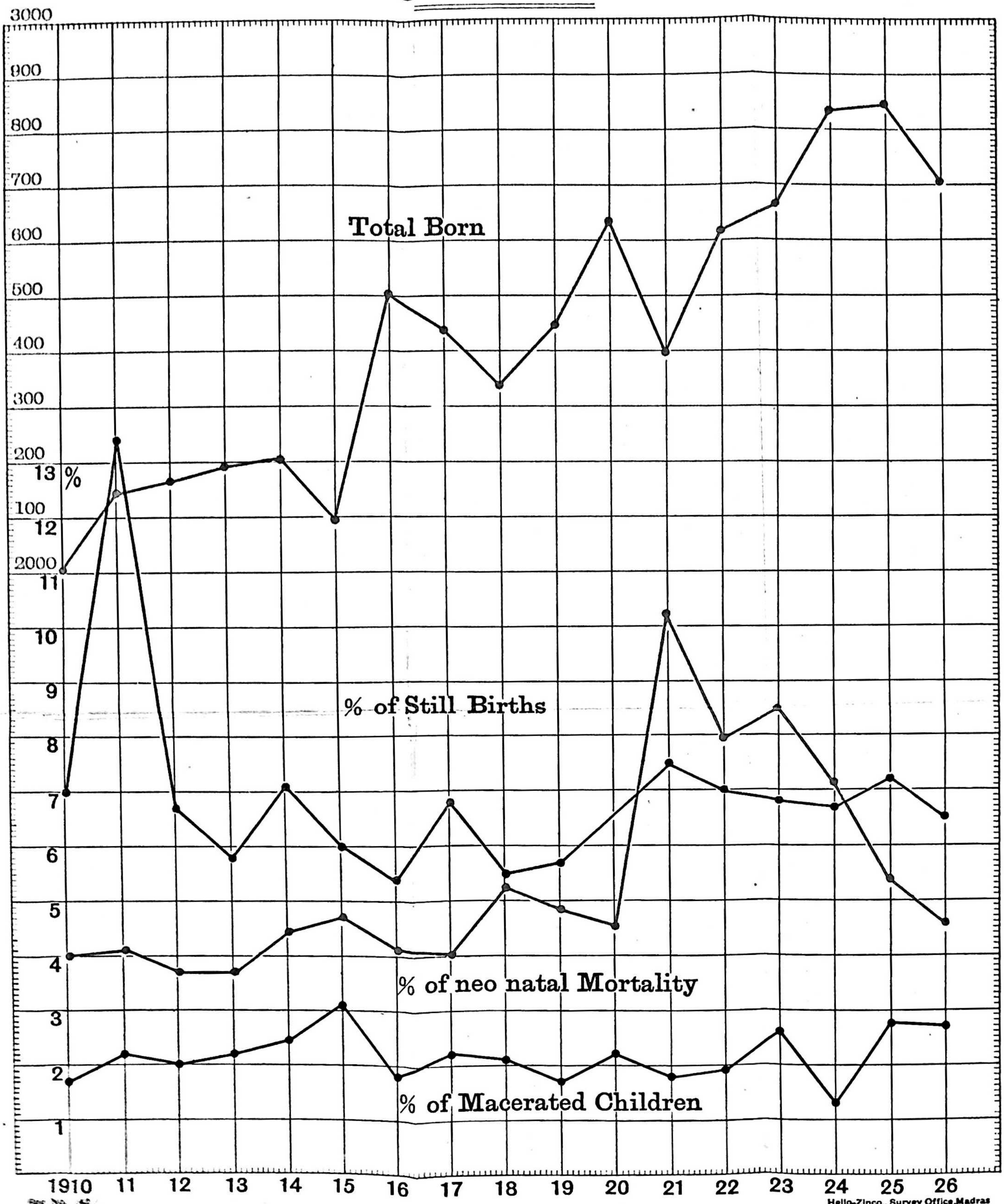


Reg. No. 142/11
Copies. 500

Helio-Zinco., Survey Office Madras
1928.

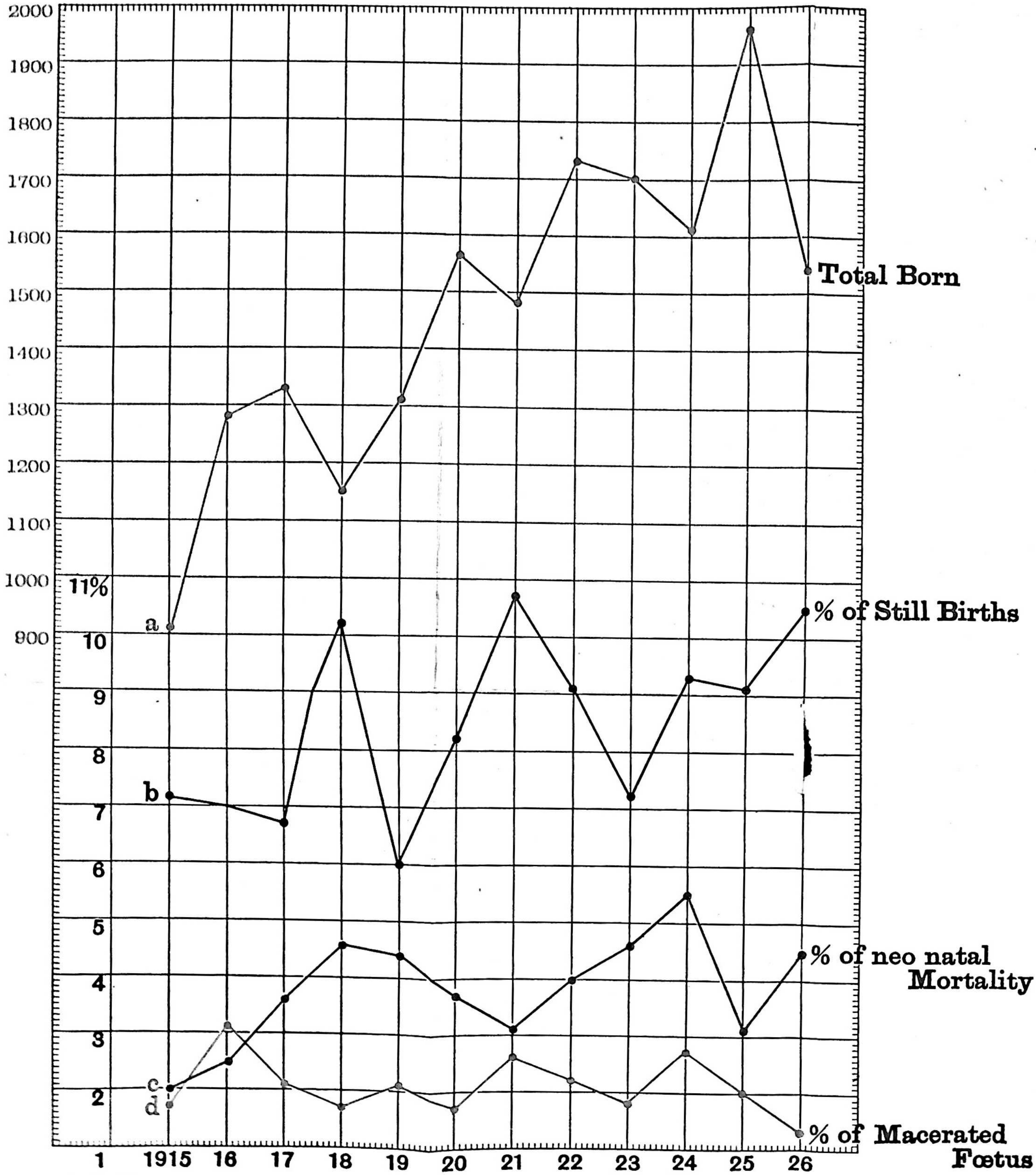

Hospital B
11%
10
9
8
7
6
5
4
3
2
1
0
1915
16
17
18
19
20
21
22
23
24
25
26
% of total Still Births
% of Forceps
% of Still Birth from Forceps
Reg. No. 142/10
Copies. 500
Helio-Zinco., Survey Office, Madras
1928

Hospital A
CHILDREN



Helio-Zinco., Survey Office, Madras
1926.

Hospital B
CHILDREN

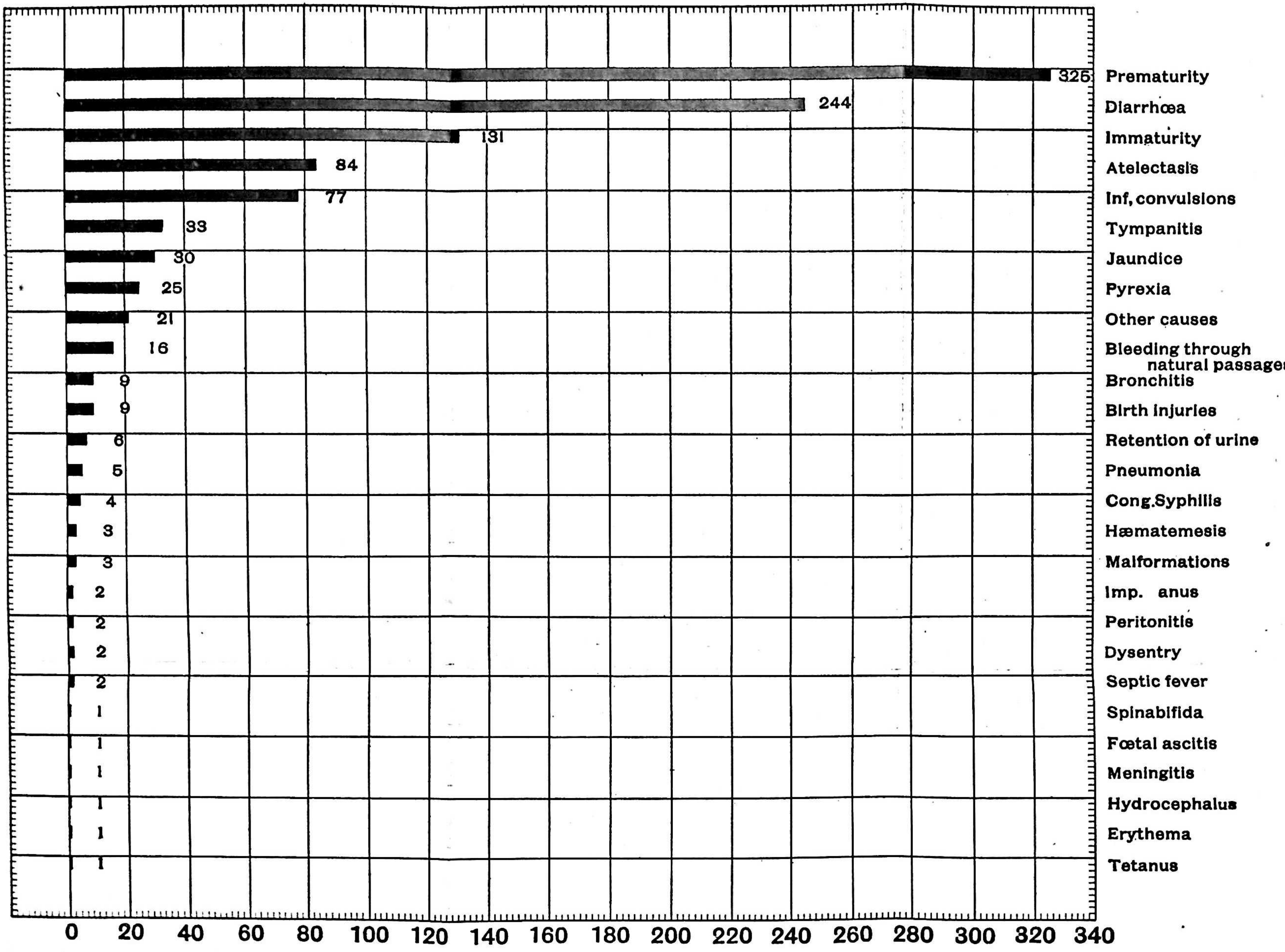


Reg. No. 142
Copies.
Helio-Zinco., Survey Office Madras
1928.

Hospital A

Causes of Neo-natal Mortality for the years 1921 to 1925.

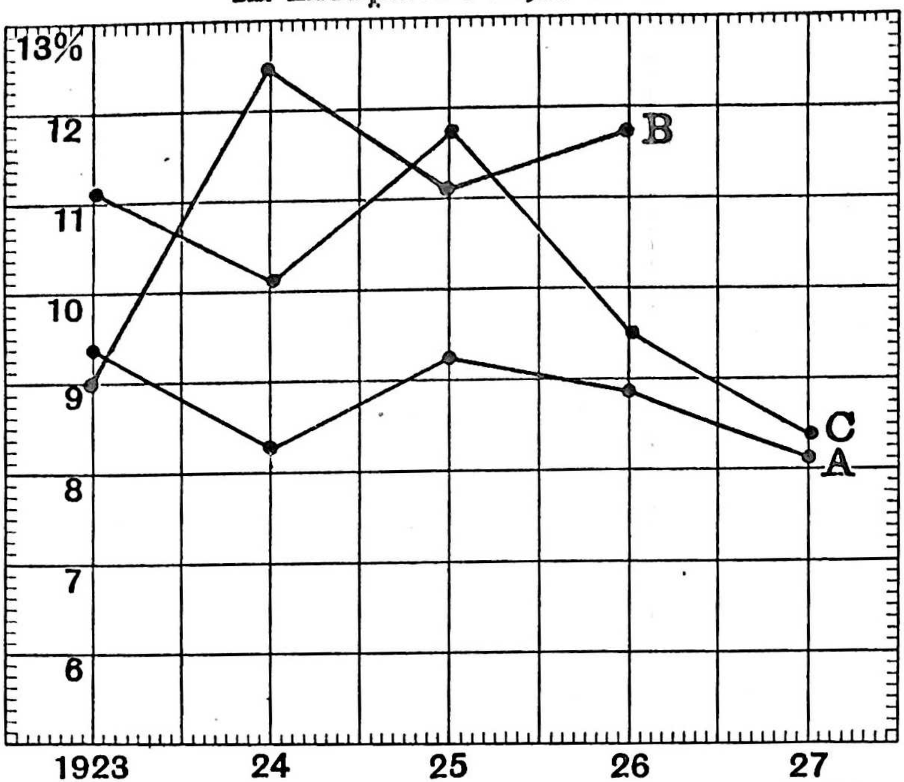
Total No. of cases 1039



Reg. No. 142/3
Copies. 50

Helio-Zinco., Survey Office Madras
1928.

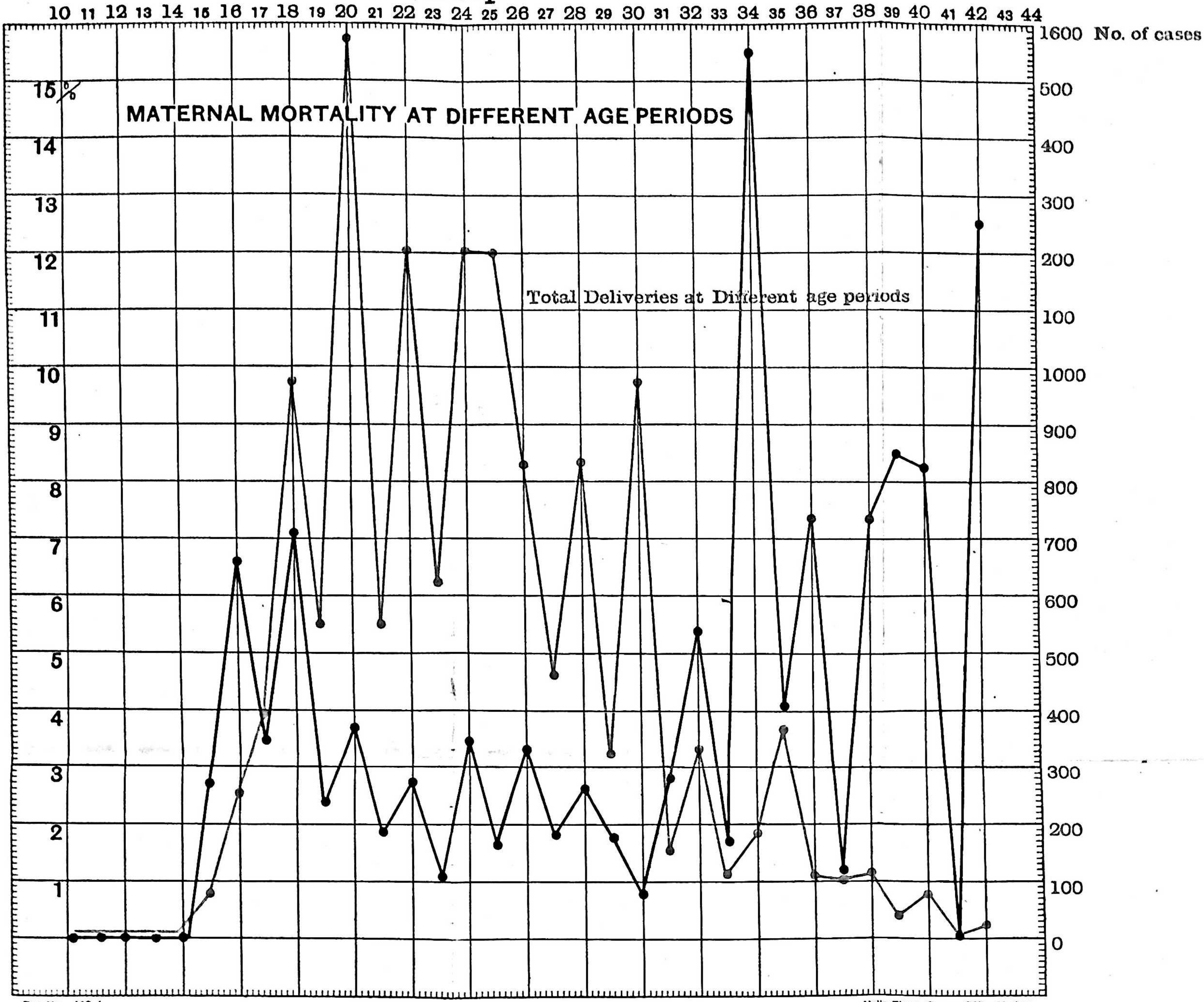
% of Still Births including Macerated Fœtus in Hospitals A, B & C



Reg. No. 142/13
Copies. 500

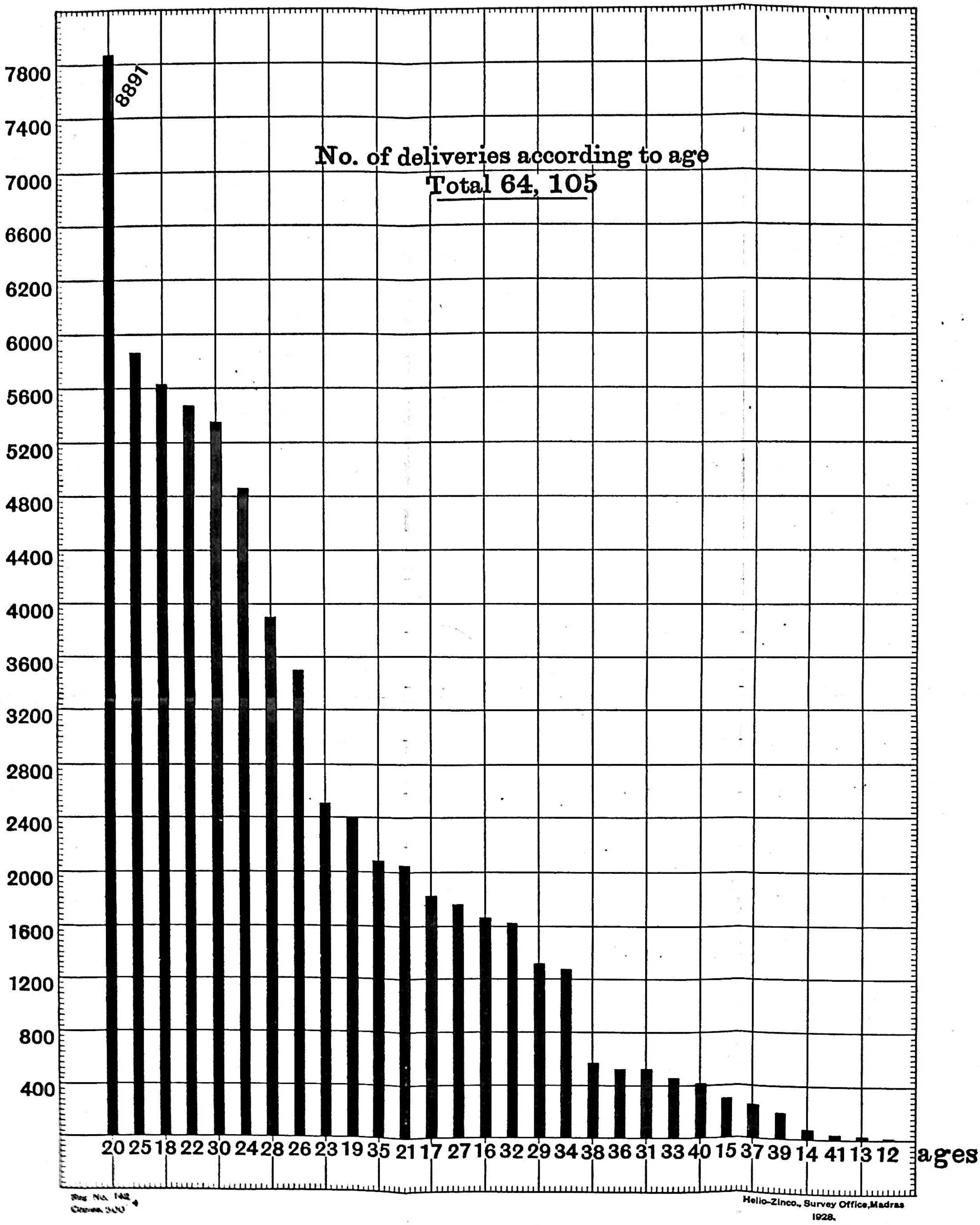
Helio-Zinco., Survey Office, Madras
1928.

Hospital A

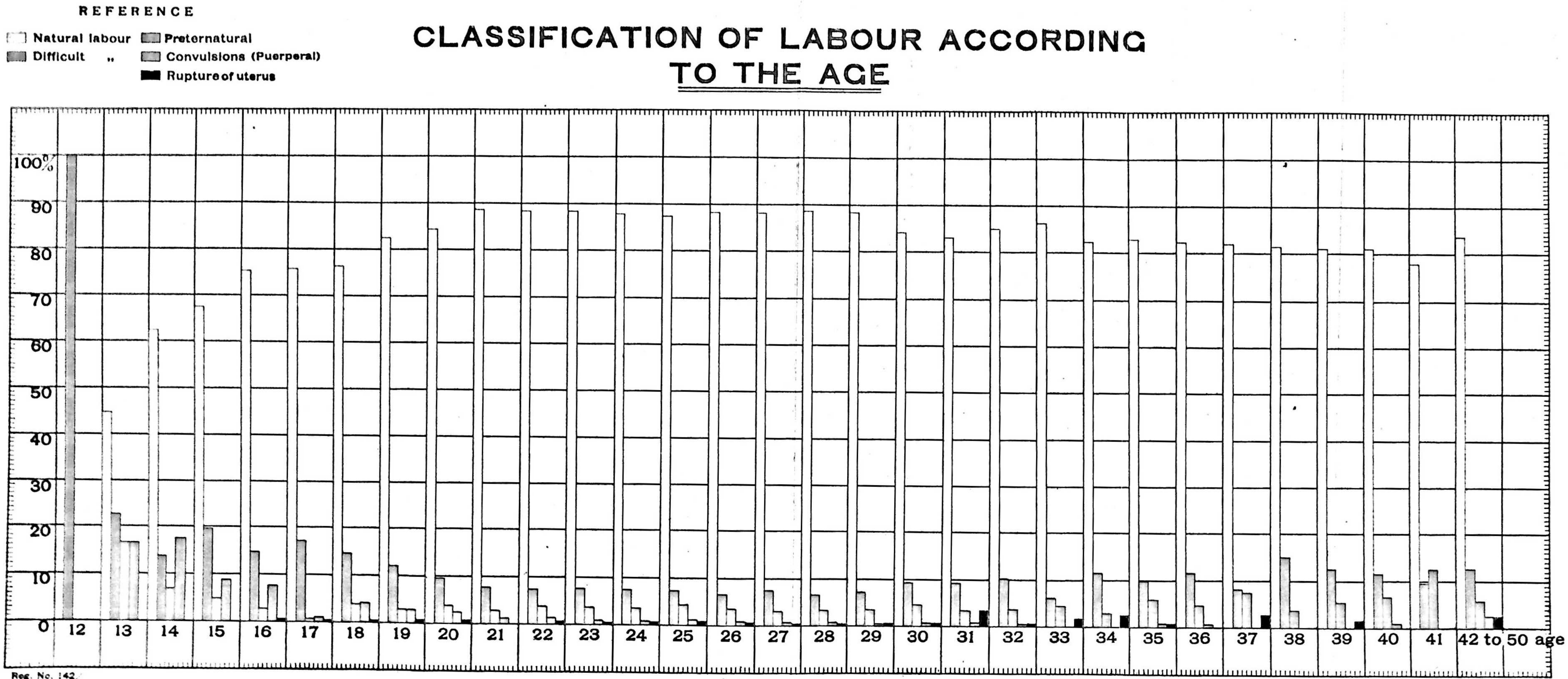


Reg. No. 142/8
Copies. 500

Helio-Zinco., Survey Office, Madras
1928.


No. of deliveries according to age
Total 64, 105
8891
7800
7400
7000
6600
6200
6000
5600
5200
4800
4400
4000
3600
3200
2800
2400
2000
1600
1200
800
400
20 25 18 22 30 24 28 26 23 19 35 21 17 27 16 32 29 34 38 36 31 33 40 15 37 39 14 41 13 12
ages
Helio-Zinco., Survey Office,Madras
1928.

CLASSIFICATION OF LABOUR ACCORDING TO THE AGE



Reg. No. 142/1
Copies 500

Helio-Zinco., Survey Office, Madras.
1928.

Statement showing the details of delivery of 175 cases in the ages of 13, 14 & 15 in nearly 10,000 confinements.

Age	Total No. of cases	% to total confinements	Primi	Multi	Natural	Tedious	Forceps	Podalic version	Podalic extraction	Eclampsia	Complex	Abortion	Vesicular mole	Details of child: Average weight	Details of child: Born alive	Details of child: Still born	Details of child: Macerated	Causes of foetal death: Prematurity	Causes of foetal death: Convulsions	Causes of foetal death: Hydramnios	Causes of foetal death: Perforation	Causes of foetal death: Prolapse of cord	Causes of foetal death: Other causes
13	5	0.05%	5 (100%)	Nil	4 80%	—	—	—	—	— —	—	1 20%	— —	$4\frac{15}{16}$	3 60%	1 20%	—	1 20%					
14	34	0.34%	34 (100%)	Nil	25 73.53%	1 0.03%	2 0.06%	— —	1 0.03%	— —	1 003%	4 11.76%	— —	$4\frac{13}{16}$	29 85.29%	3 0.9	1 0.3	2 0.6	1				
15	136	1.36%	126 92.65%	10 7.35%	83 61.03%	4 2.94	25 18.38	4 2.94	6 4.41	— —	6 4.41	8 5.88%	1	$5\frac{3}{8}$	107 78.18%	12 8.82	8 5.88	5 3.68	4	1	1	1	8
Total	175	1.75	165 94.29	10 5.71	112 64%	5 2.86	27 15.43	4 2.29	7 4.0	13 7.43	7 4.0	13 7.43%	— —	$5\frac{1}{4}$	139 79.43	16 9.14	9 5.14	8 4.5	5	1	1	1	9

Reg. No. 142/2
Copies 500

Helio-Zinco., Survey Office, Madras.
1928.